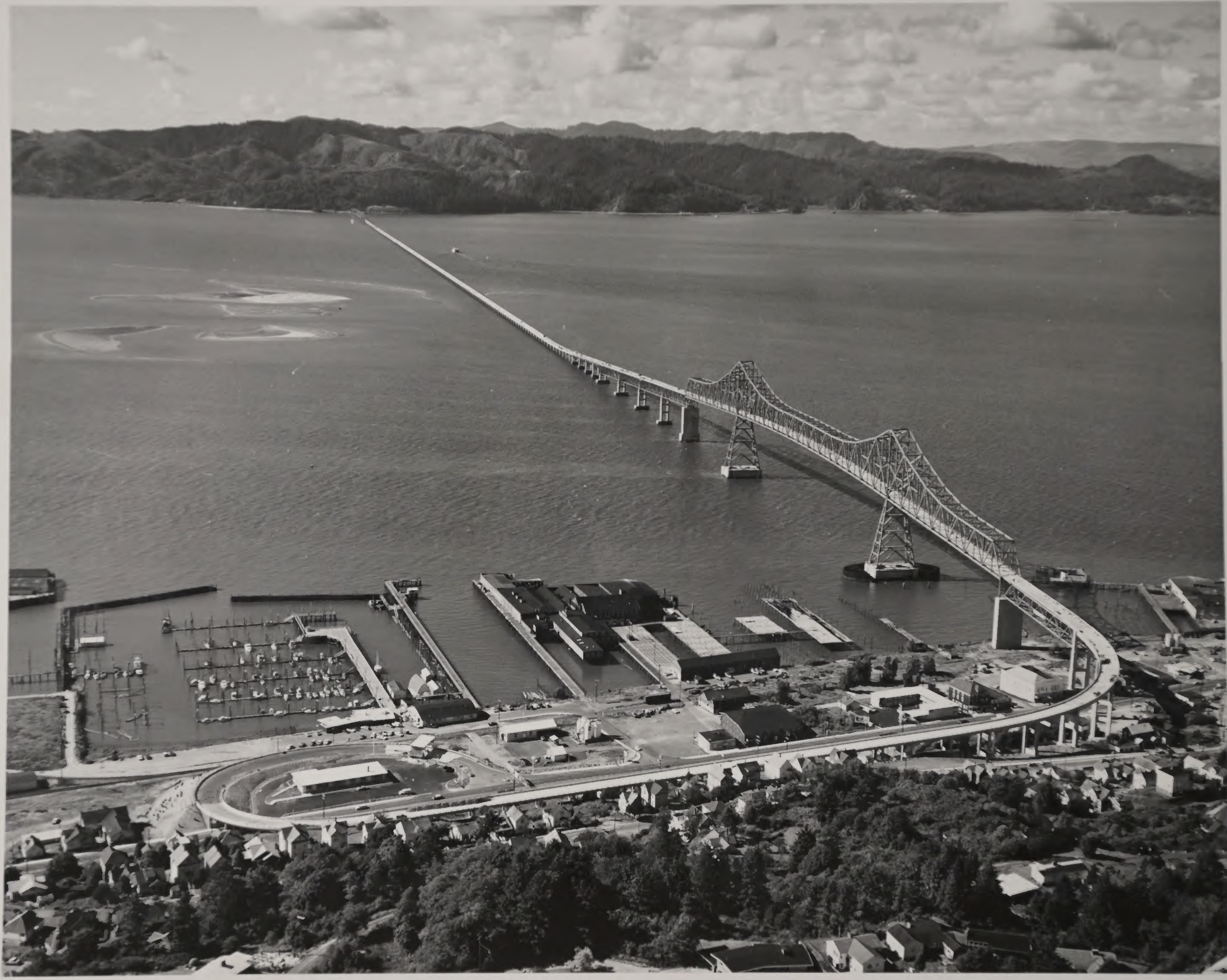
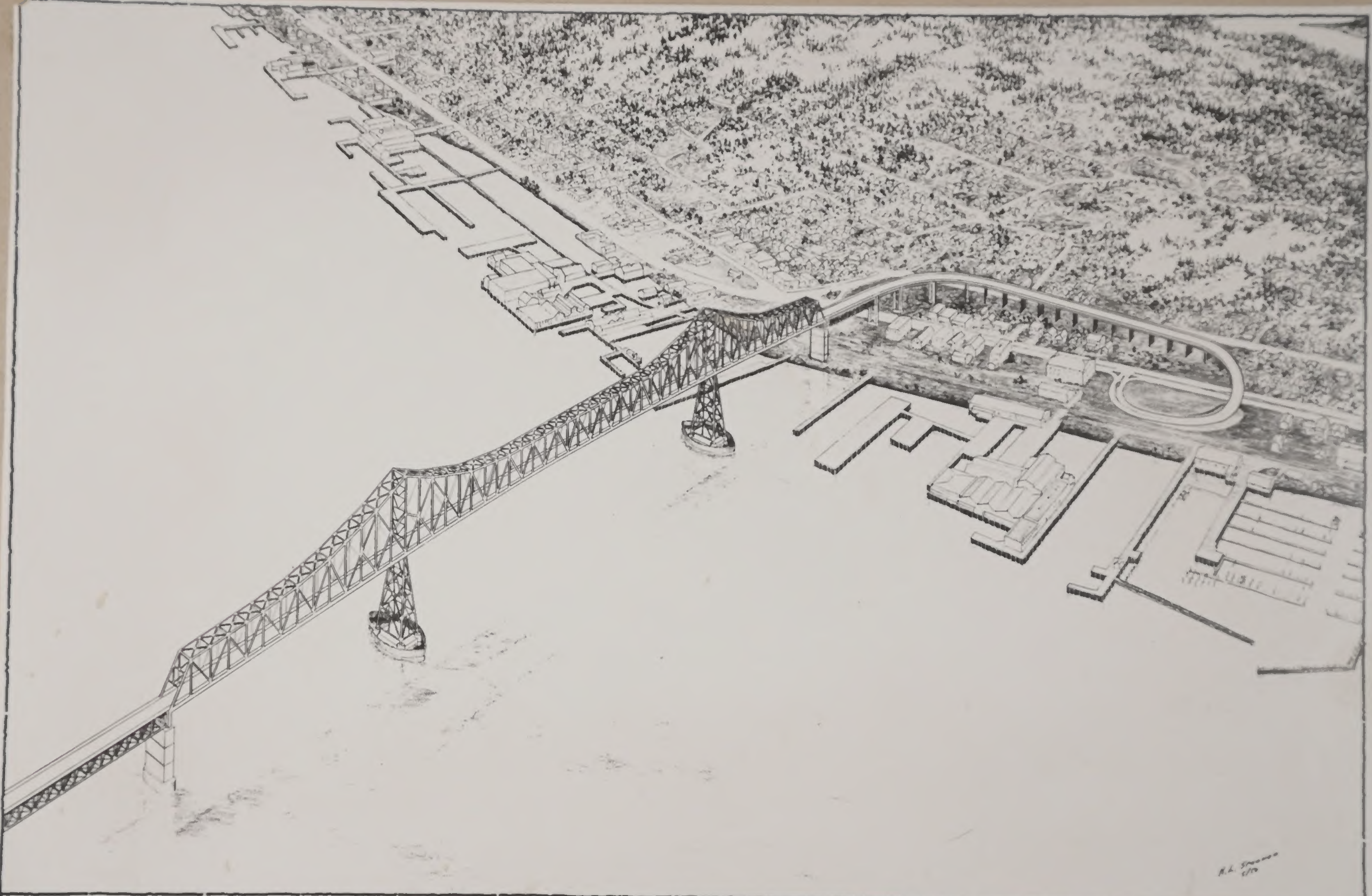
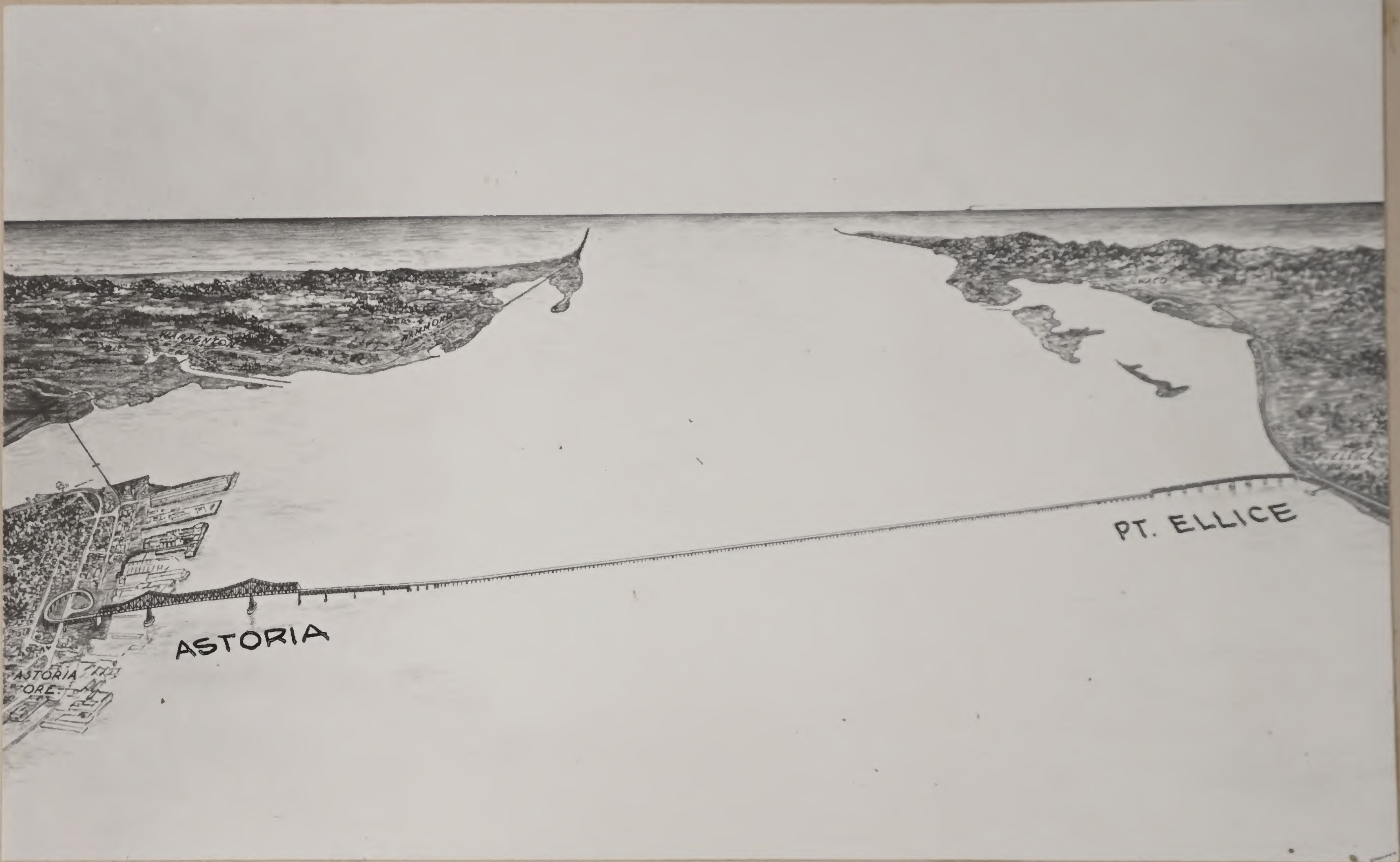




· · ASTORIA · BRIDGE ~ MAIN · CHANNEL · CROSSING · ·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ILWACO
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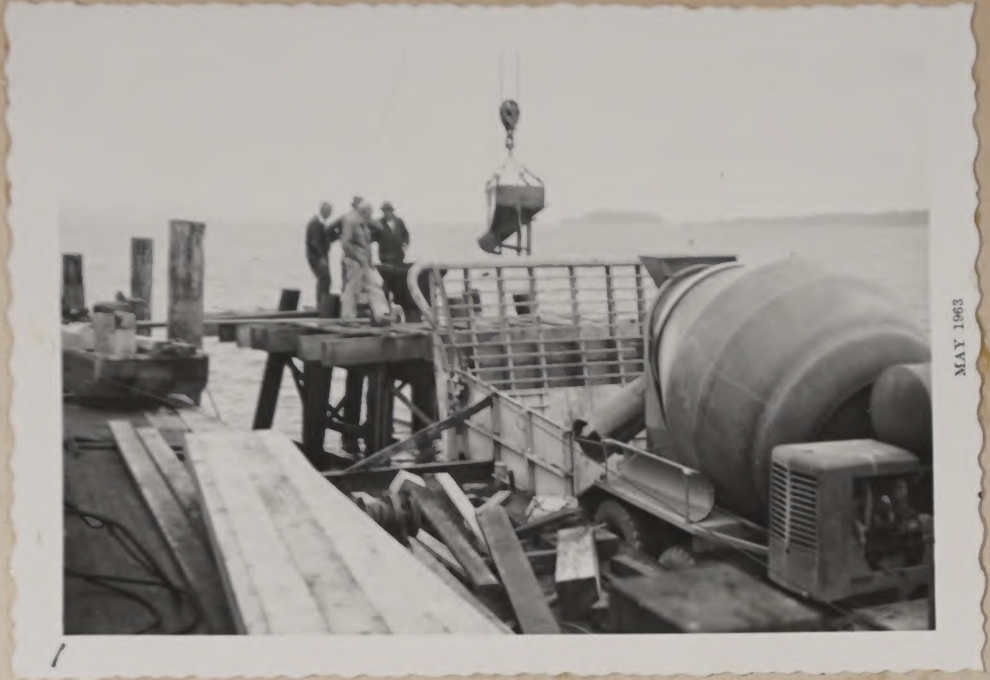
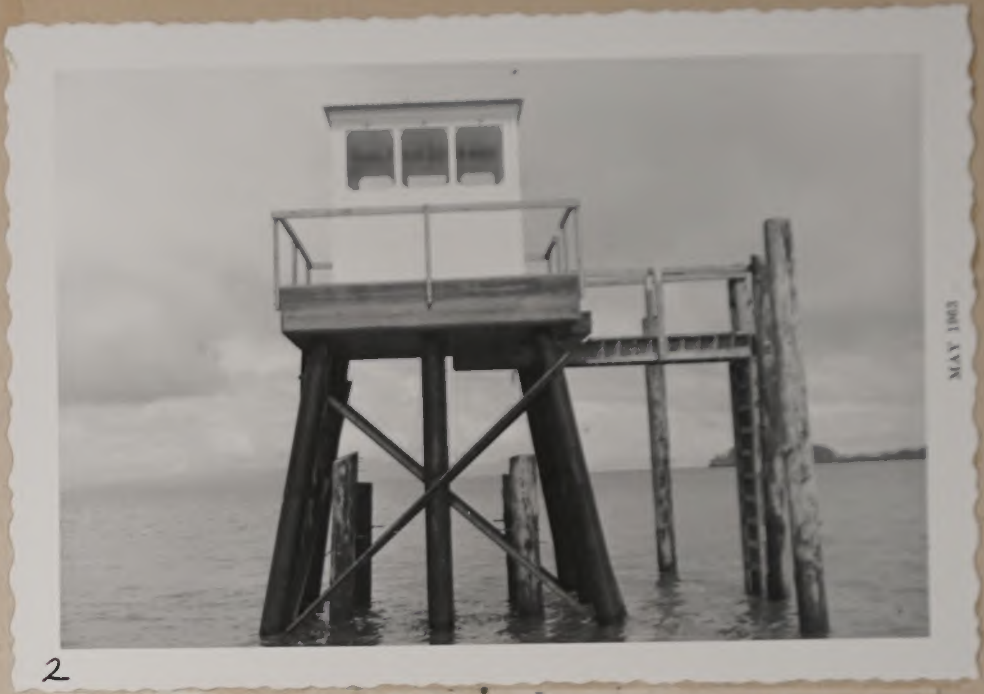


1

1 Palmberg Construction Co. was awarded the contract for construction of four triangulation towers. Steel shell piles were driven into the sand and filled with concrete.

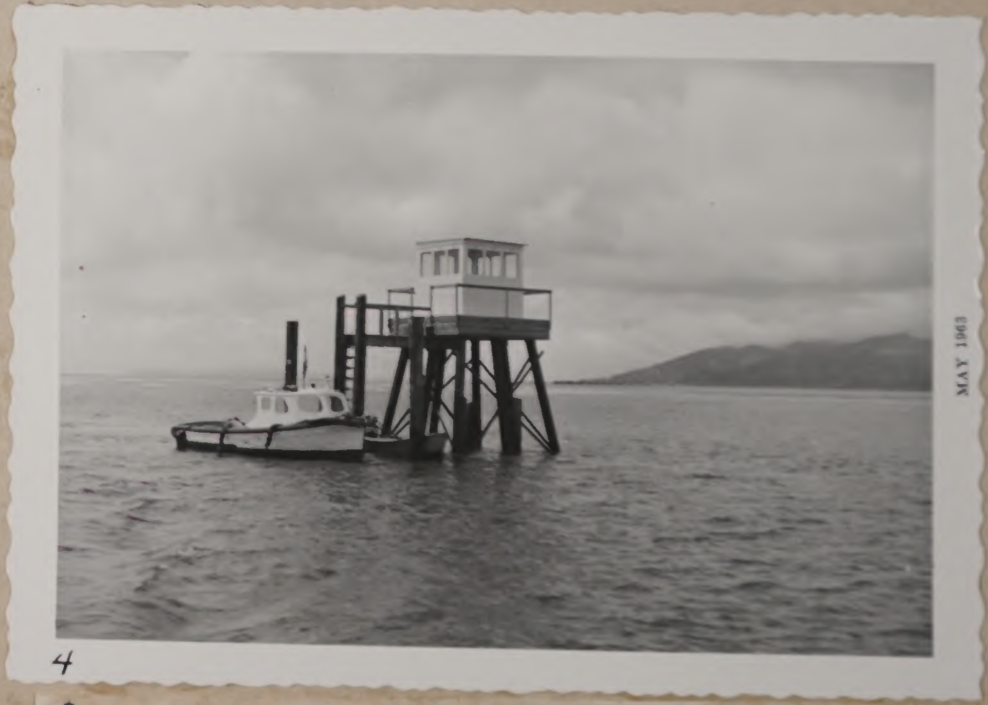


2

Triangulation tower "Net". The eight leg towers were very stable. No movement was ever detected. This point was located on bridge centerline about 4,500 feet north of the Oregon shore.

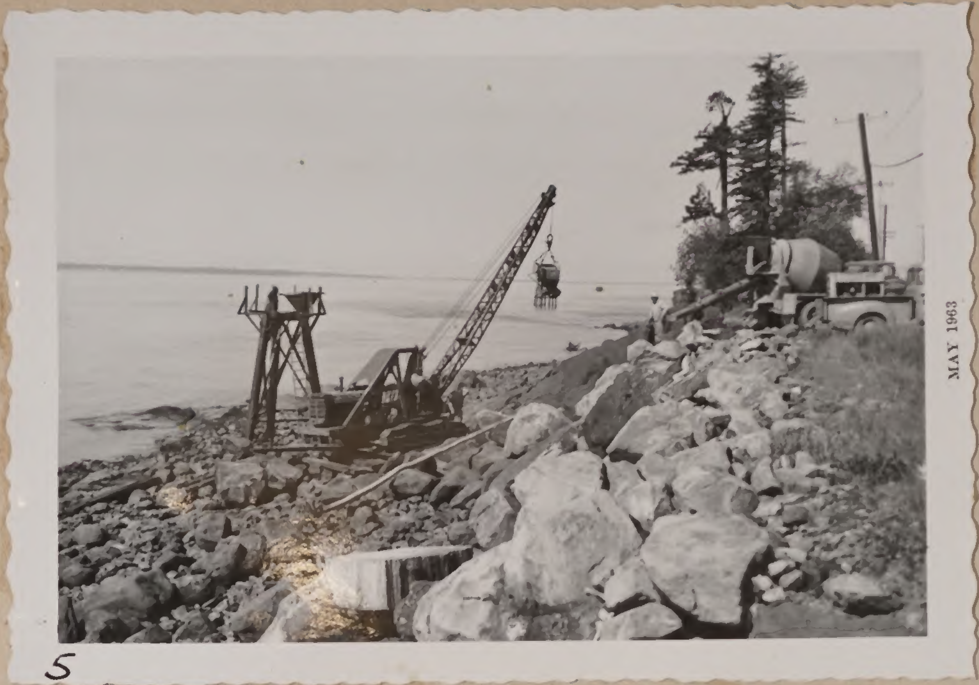
3

Triangulation point "Gray" on the Washington shore. This point was 4,700 feet downstream from the bridge centerline.



4

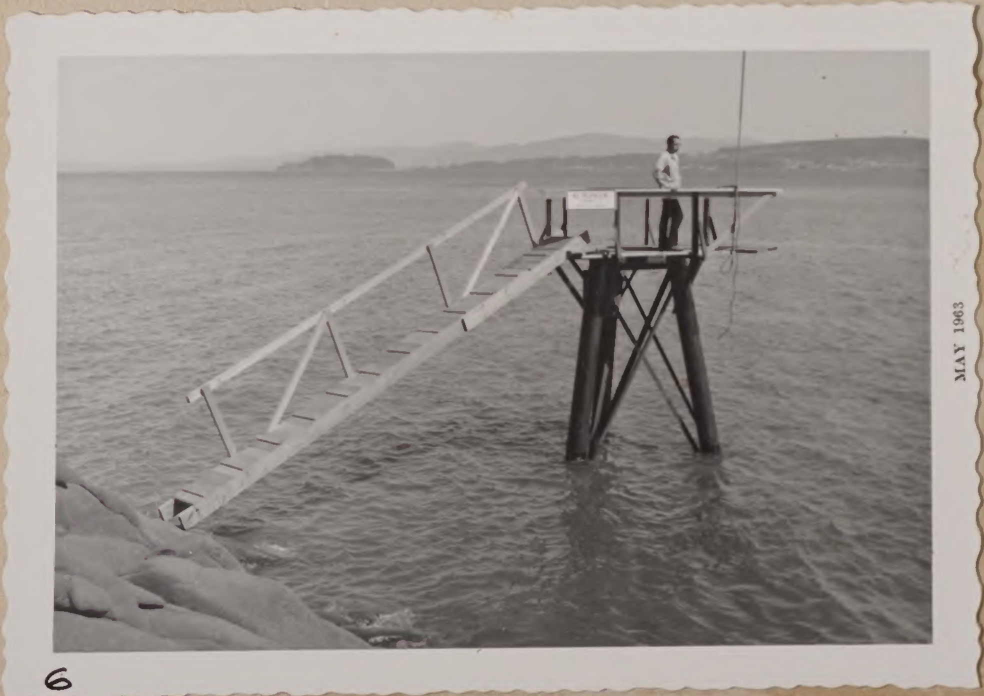
Triangulation point "Sand" about 2,500 feet downstream of bridge centerline and 4,000 feet from the Oregon shore. Triangulation point "Chinook" (Not pictured) was similar and located 4,400 feet downstream from bridge centerline and 5,300 feet from the Washington shore.



MAY 1963

5

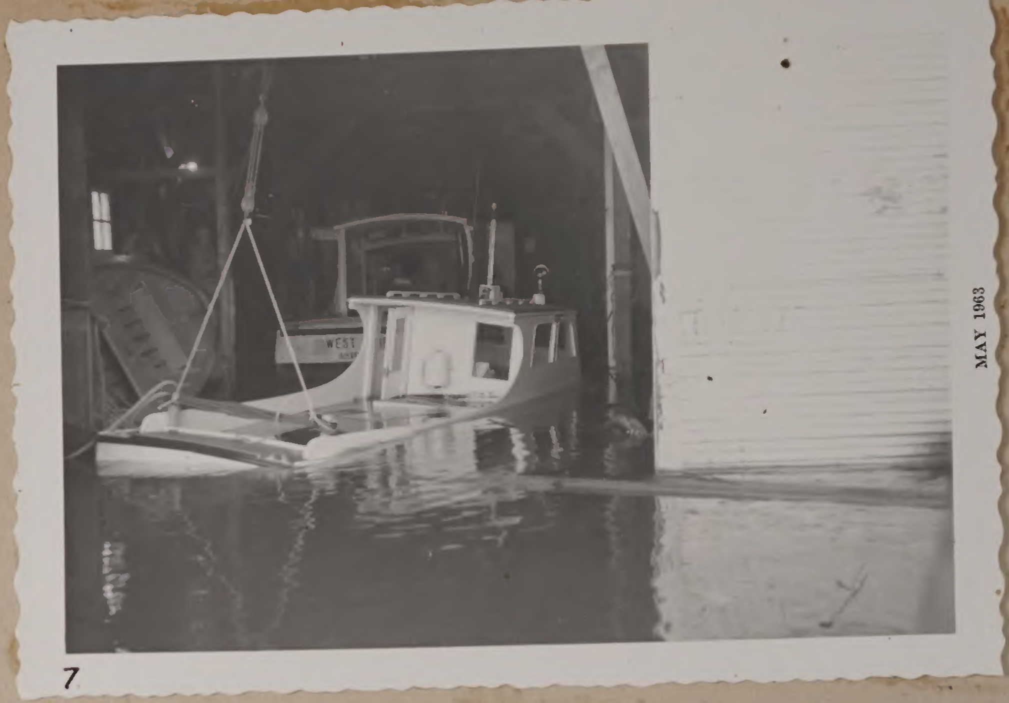
Triangulation point "3-leg" on centerline of bridge on the Washington shore. Only a three leg tower was used because the strong tides presented a little problem here.



MAY 1963

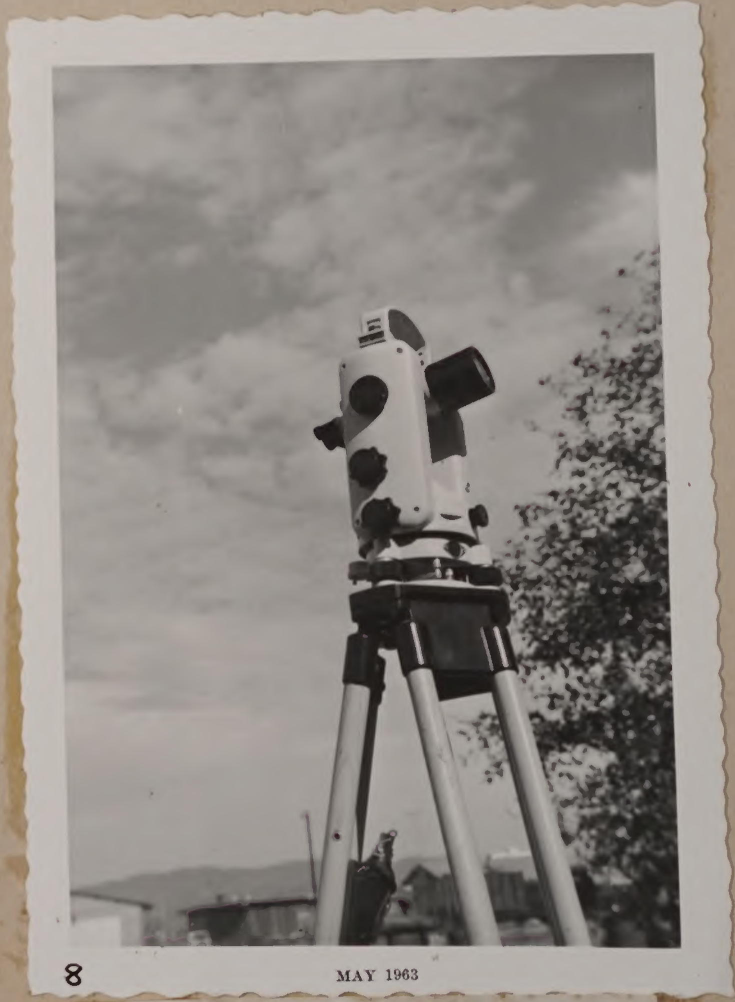
6

The two state owned 26 foot boats used on the project, the "Westwind" and "Eastwind" in the foreground. The state consented to buy automatic bilge pumps after this scene was observed one morning.



MAY 1963

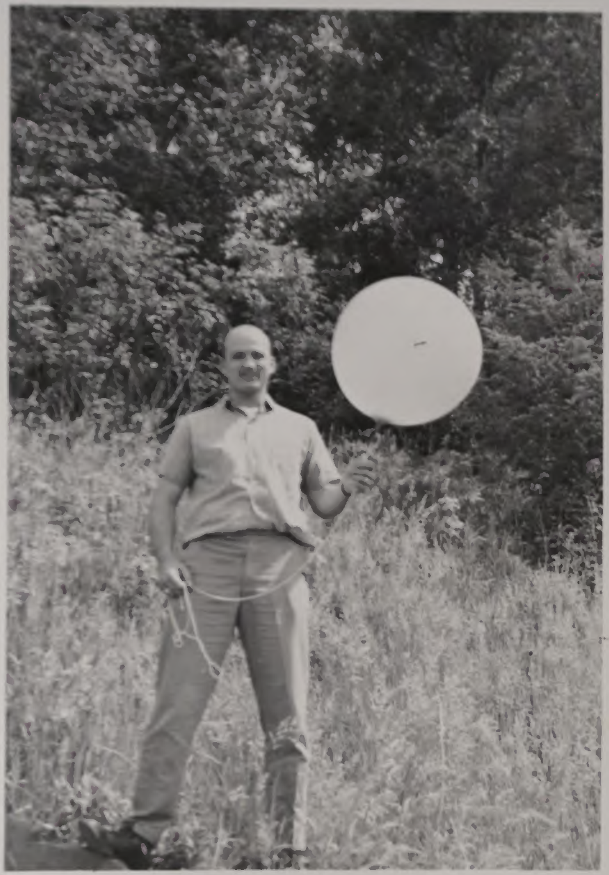
7



8

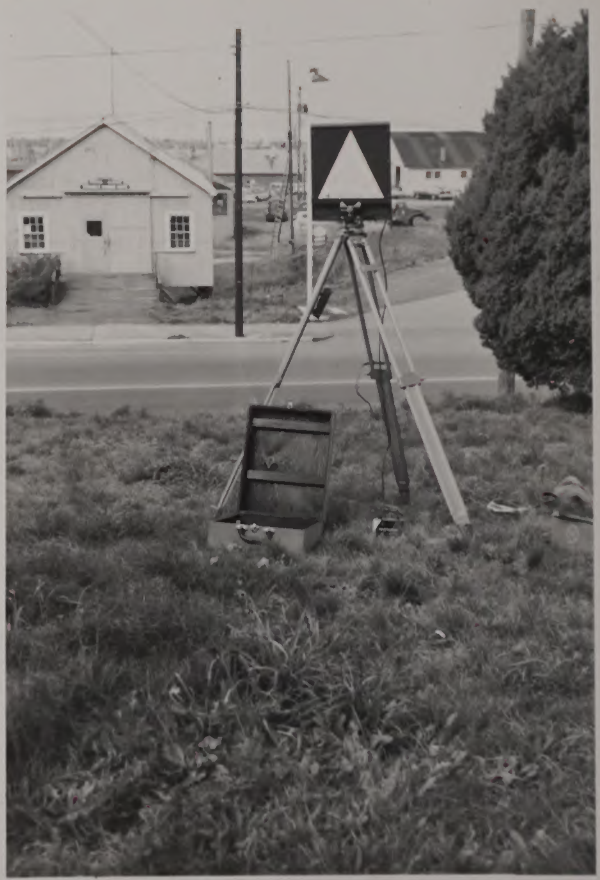
MAY 1963

The completed point "3-leg".



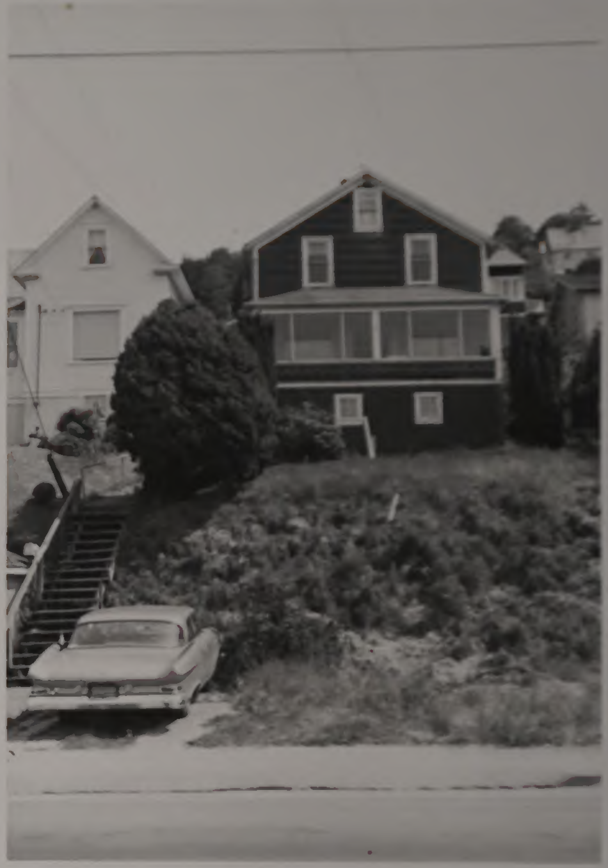
10 MAY 1963

A gas filled ballon was used to properly locate brush cutting crews to clear line of 'site between some triangulation points.



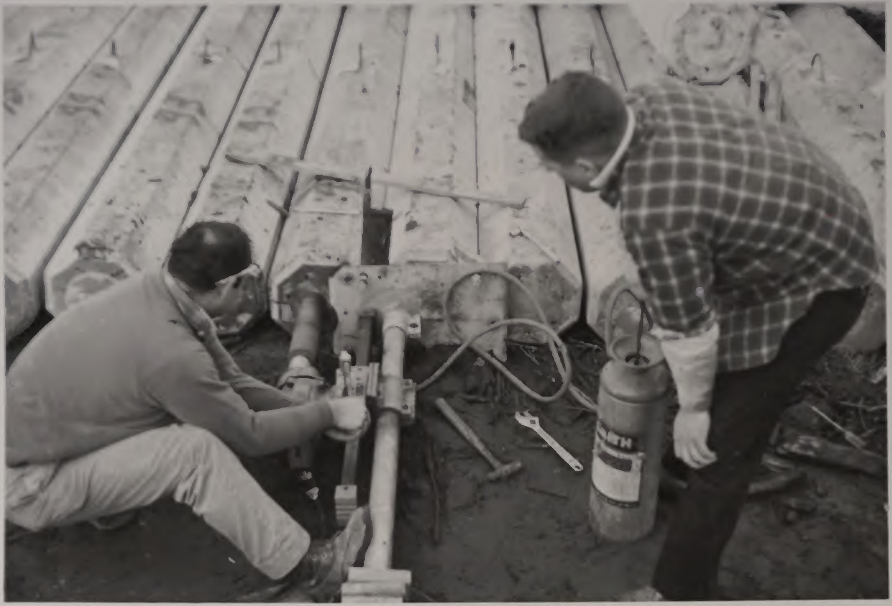
9 MAY 1963

Illuminated triangulation target. Two of these were constructed by the crew. The most satisfactory triangulation targets were "gilnet float lights", which were nothing more than a waterproof flashlight with a 3/4 inch, 360 degree light on top of it.



11 MAY 1963

The first state office building located on Marine Drive. The office later moved across the street to another vacated building.



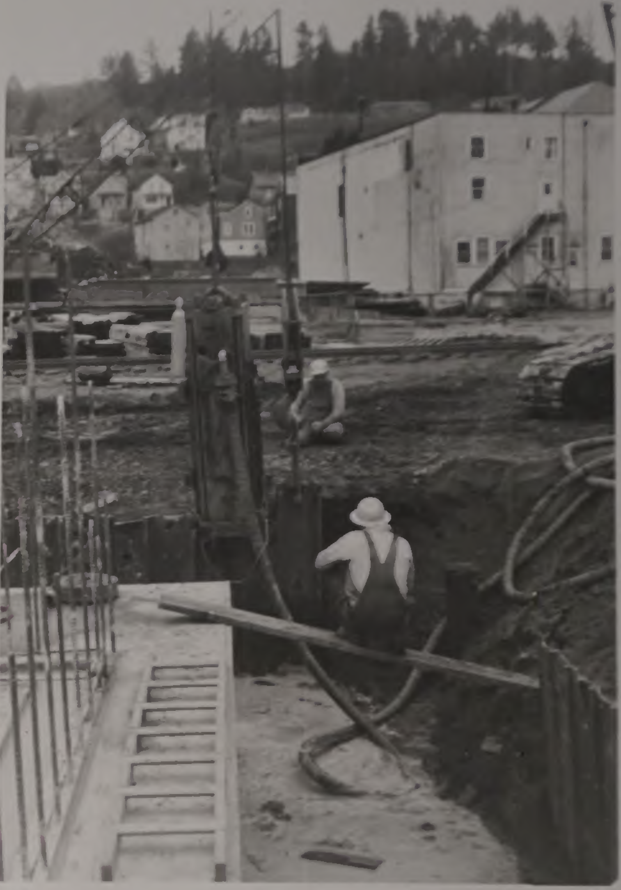
[redacted] 1963

12

Core drilling 14 inch concrete prestressed piles for pier 171. Cylinder breaks didn't come up, but cores were OK.

15

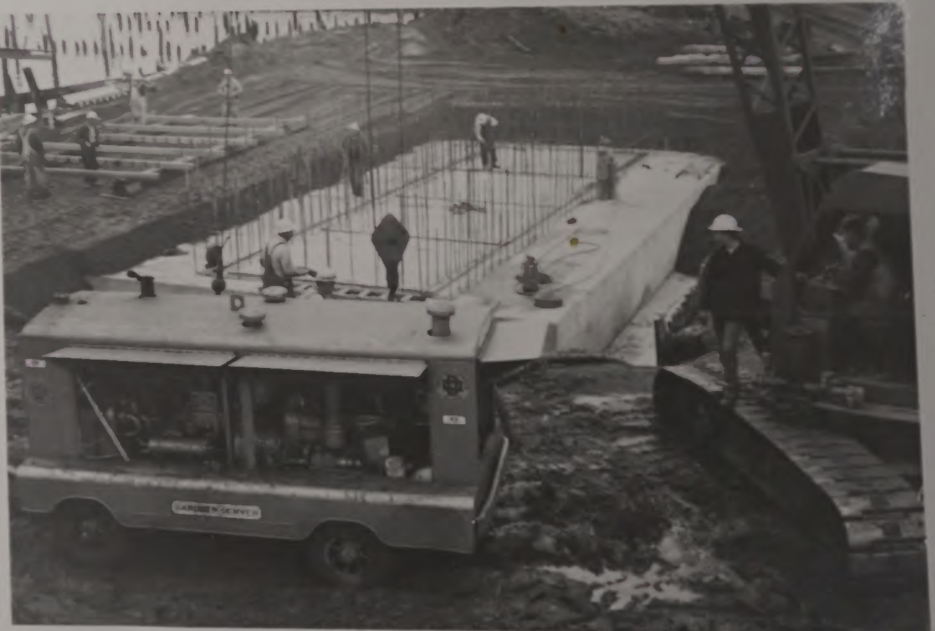
FEB 1963



13

FEB 1963

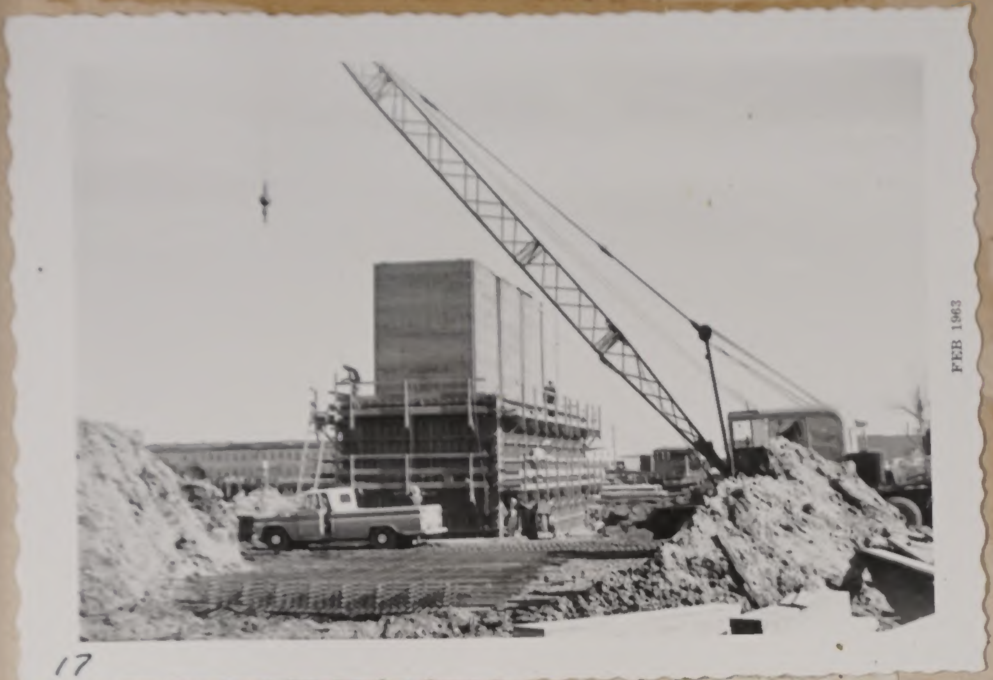
Pulling sheet piles at pier 171 by pulling on one sheet and driving on the adjacent sheet with a McKiernan Terry 9-B-3 hammer.



FEB 1963

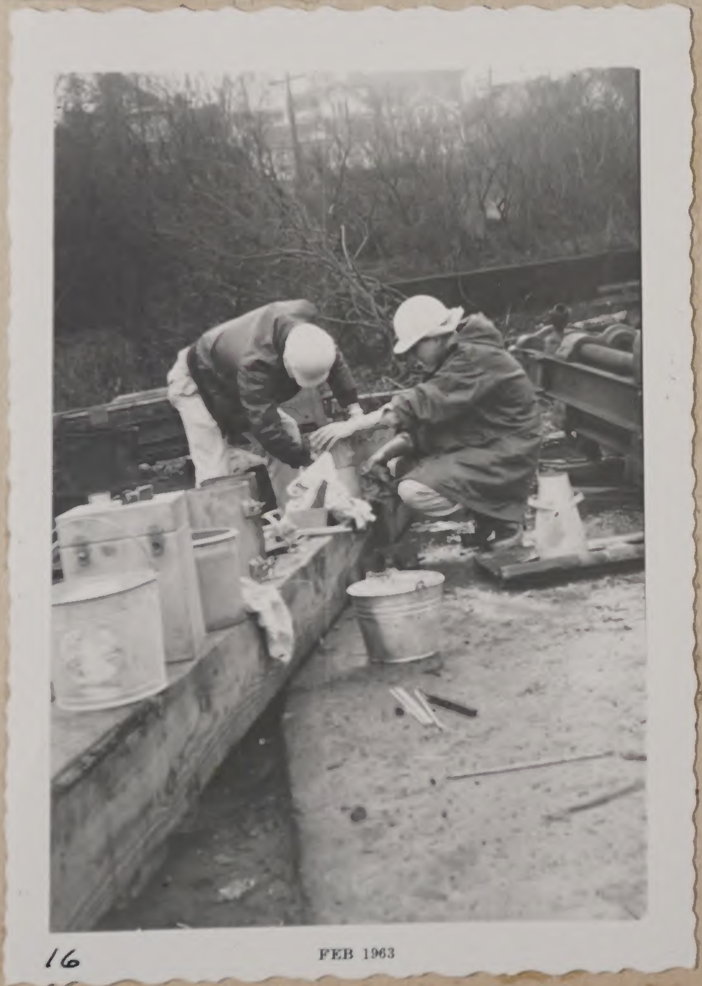
14

First and second steps of pier 171 footing.


17

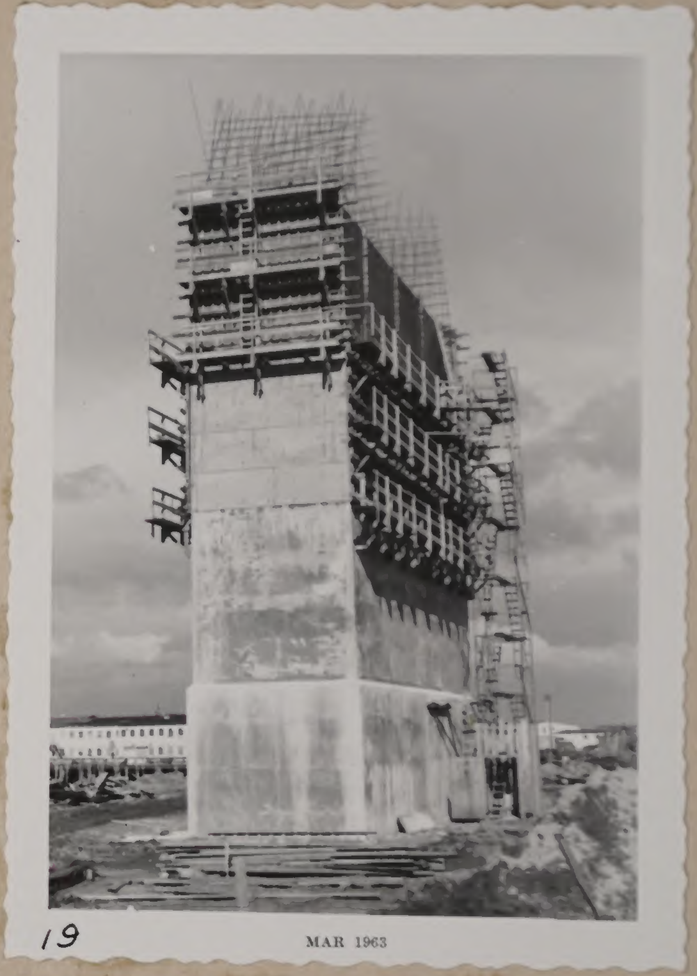
FEB 1963

Pier 171 getting off the ground. Interior forms for second lift are in place.


16

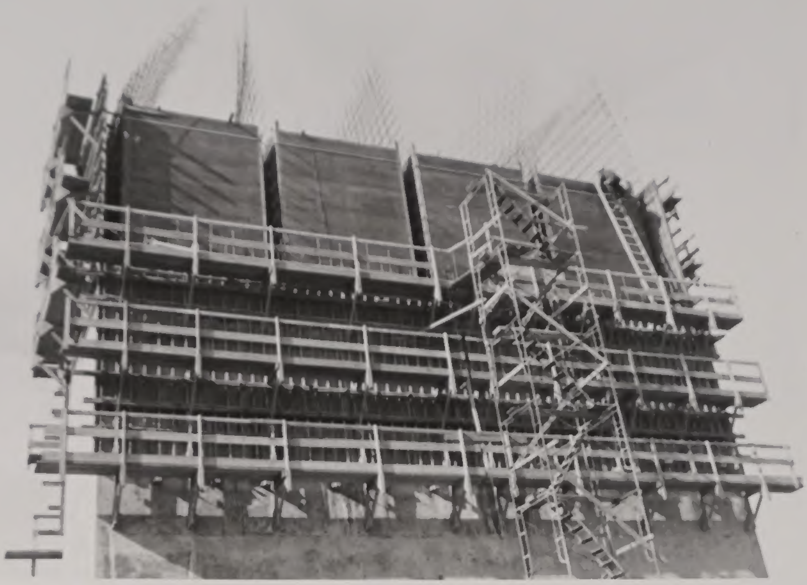
FEB 1963

Jerry Burkard and Keith Martin taking cylinders at pier 173 footing pour.


19

MAR 1963

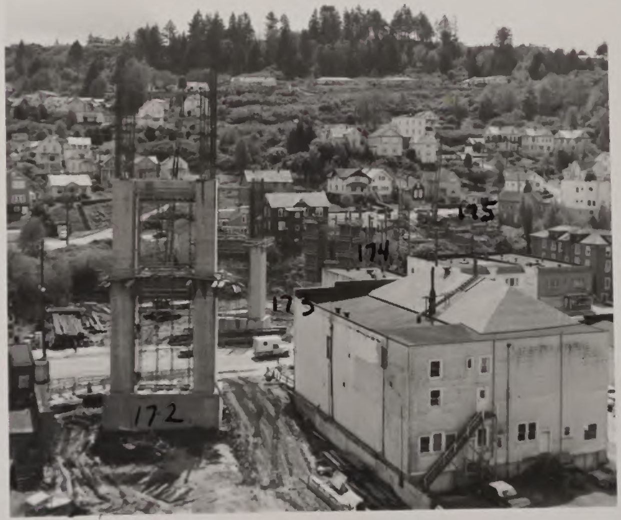
Pier 171. Out side forms being moved up. They are held in place by she-bolts.



MAR 1963

20

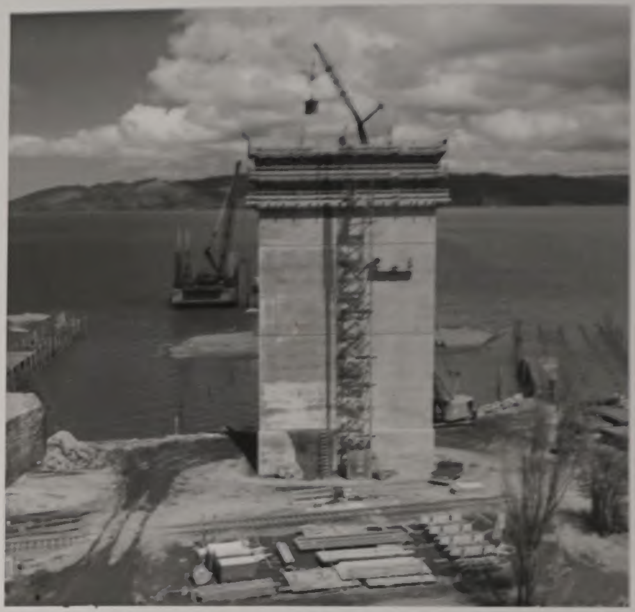
Pier 171. Note how reinforcing steel is being blown by the wind which more than occasionally blew in Astoria.



21

MAY 1963

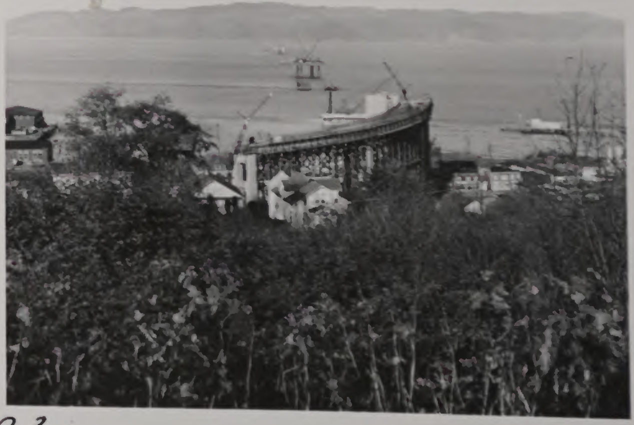
Piers 172 thru 175 midway in construction.



22

MAY 1963

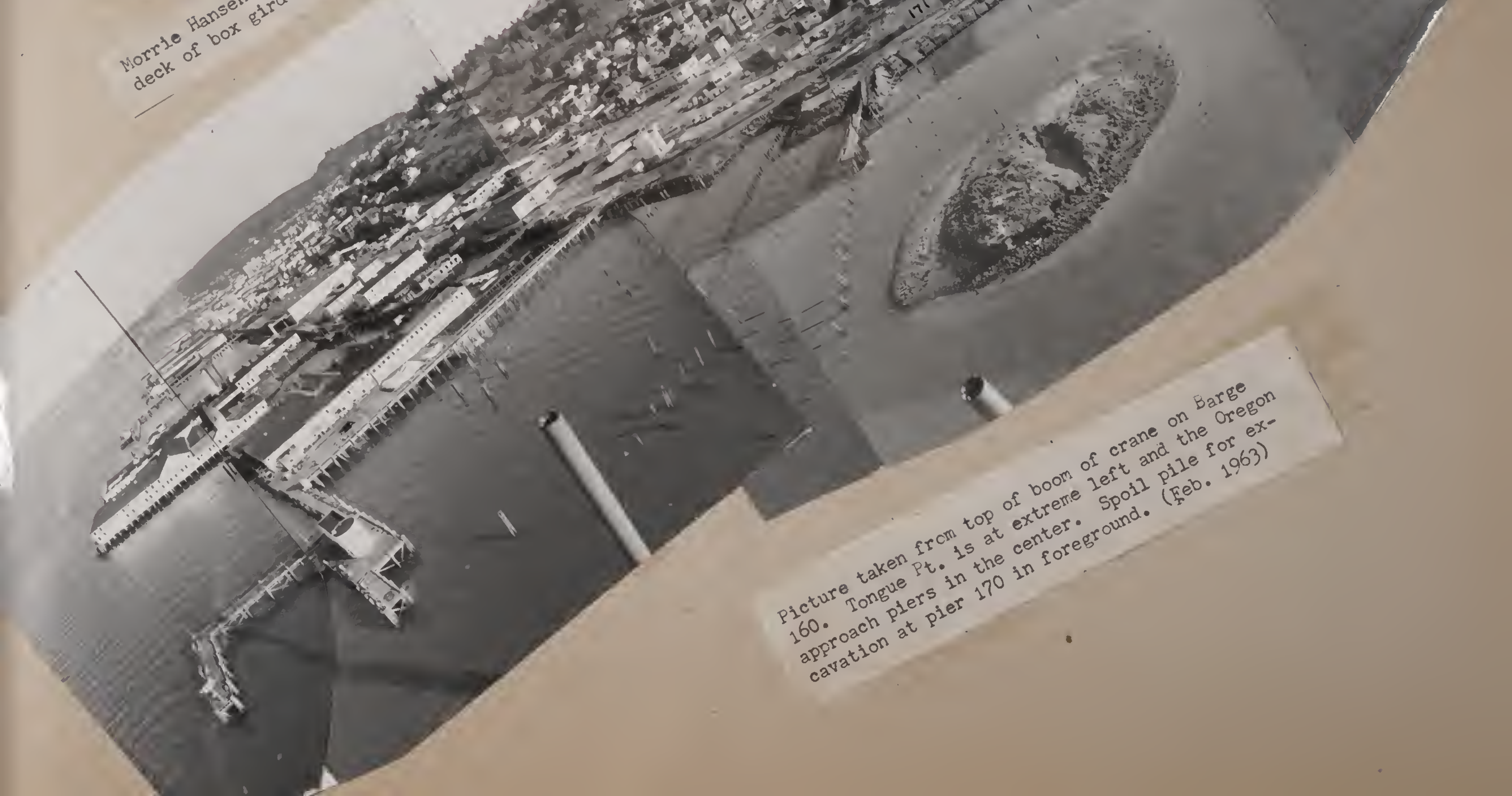
Pier 171 nearing completion. Pier 170 cofferdam in background.



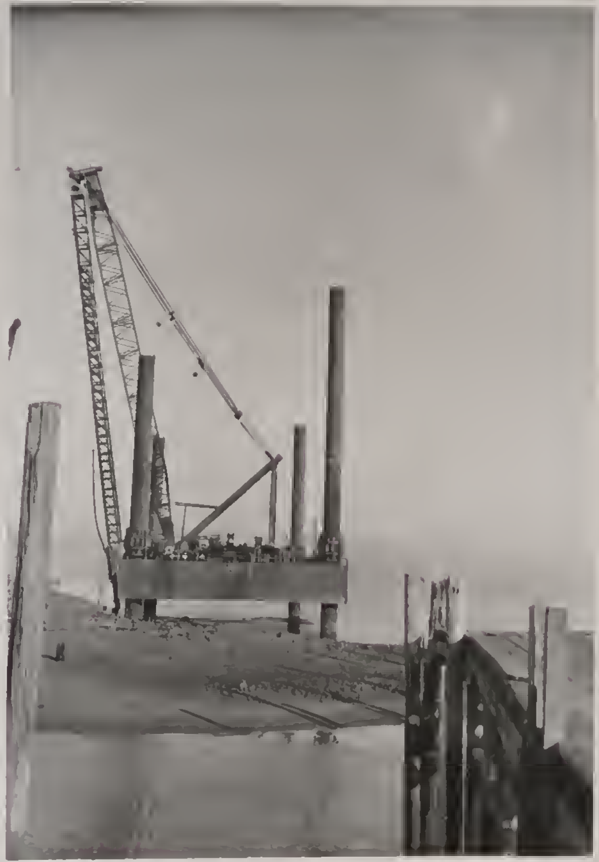
23

Falsework and forms for box girders spans from piers 172 to 175.

Morrie Hansen and Chuck Burton straight edging deck of box girder spans.



Picture taken from top of boom of crane on Barge 160. Tongue Pt. is at extreme left and the Oregon approach piers in the center. Spoil pile for excavation at pier 170 in foreground. (Feb. 1963)



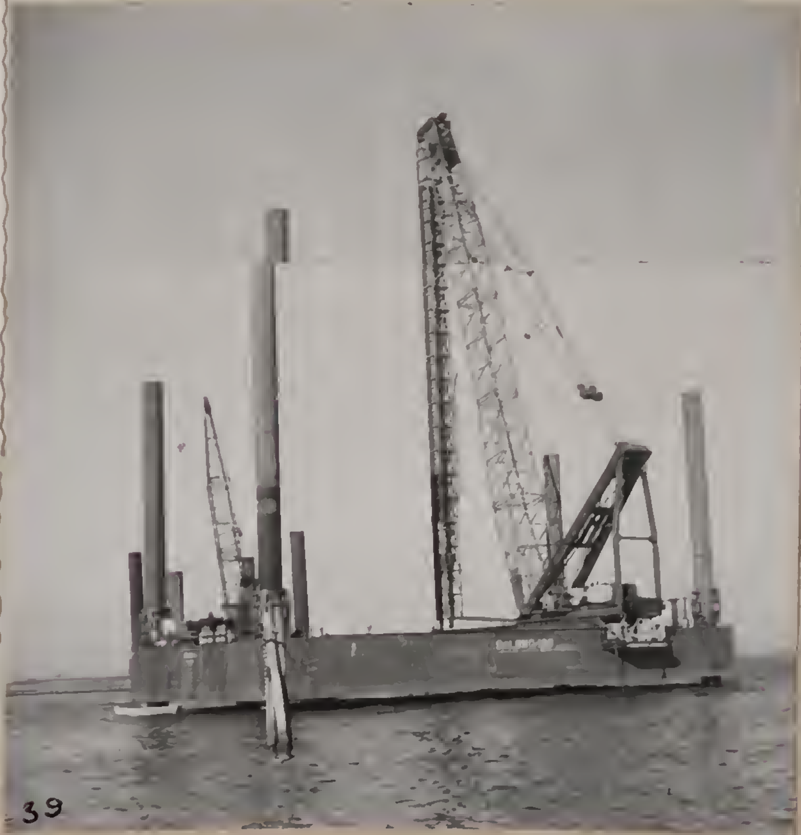
26

APR 1963

27

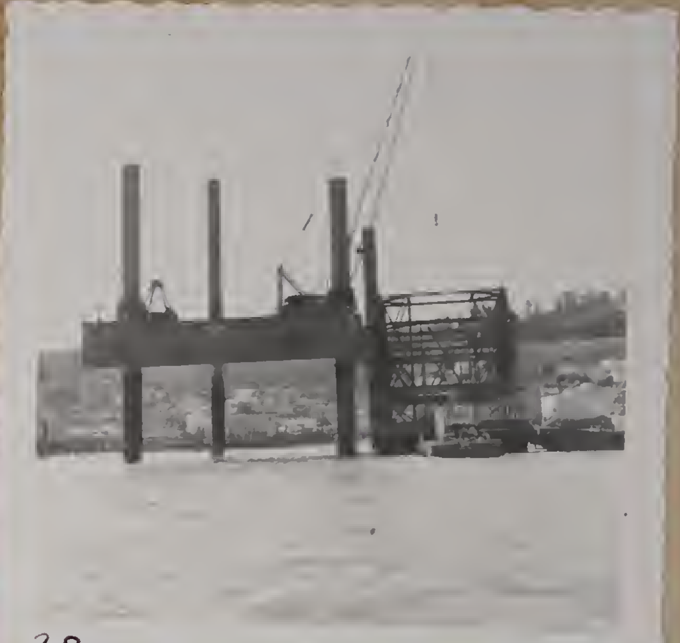
MAY 1963

Barge "DeLong 160" was constructed at Albina in Portland especially for the pile driving on this project. Cost of barge with 500 ton crane and telescoping pile driving leads was about $1,600,00. The leads and pile hammer alone weighed 100 tons.



39

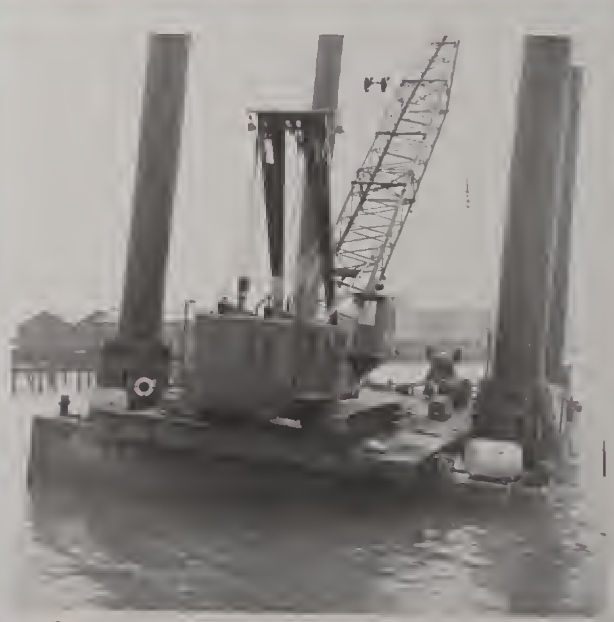
r view of Barge 160. Jet pumps on back of crane.



28

MAY 1963

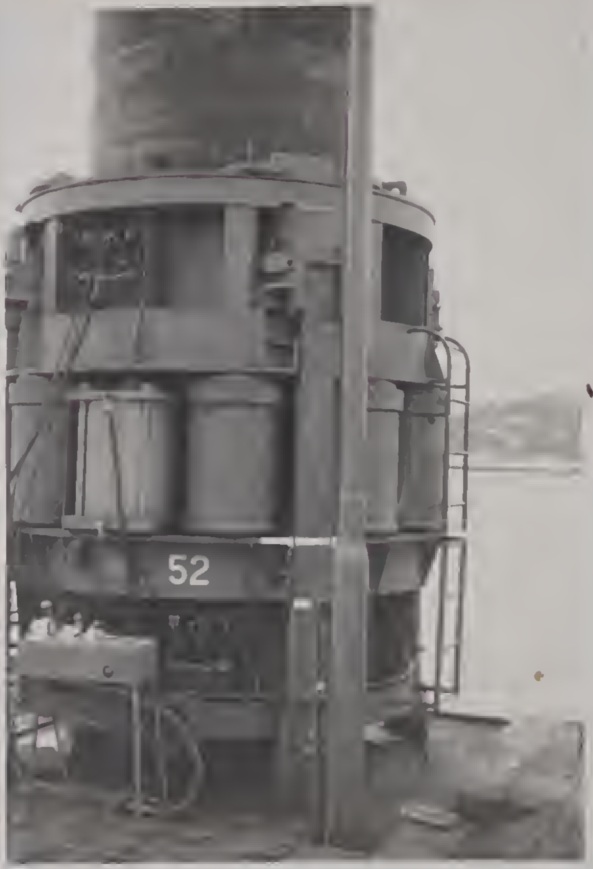
Barge 159 jacked up in order to lift off and set wale frame for pier 170 cofferdam.



29

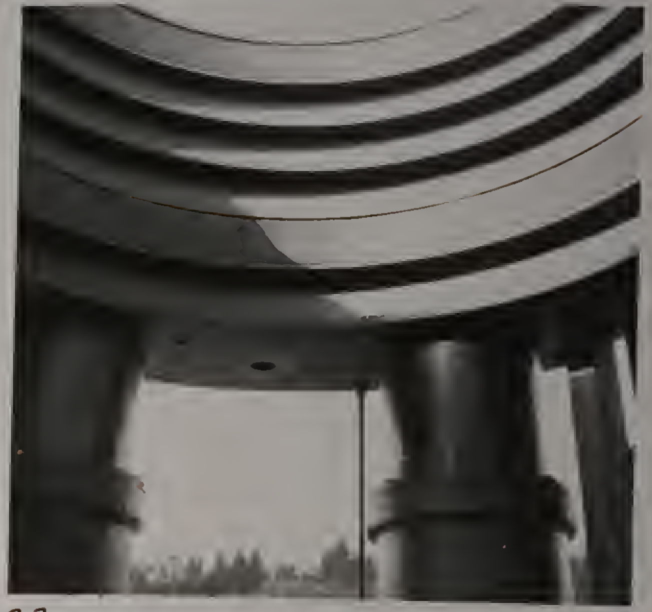
MAY 1963

Barge 143 attempting to pull a leg whi was stuck in the river bottom.



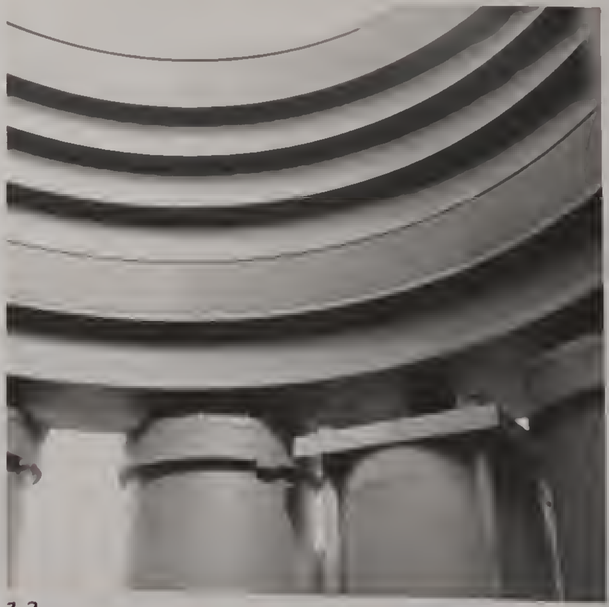
31 MAY 1963

Inside of 500 ton jack with air cylinders in open position. By alternately gripping and releasing the upper and lower portions of the jack, it moves the barge up and down the legs much like an inchworm.



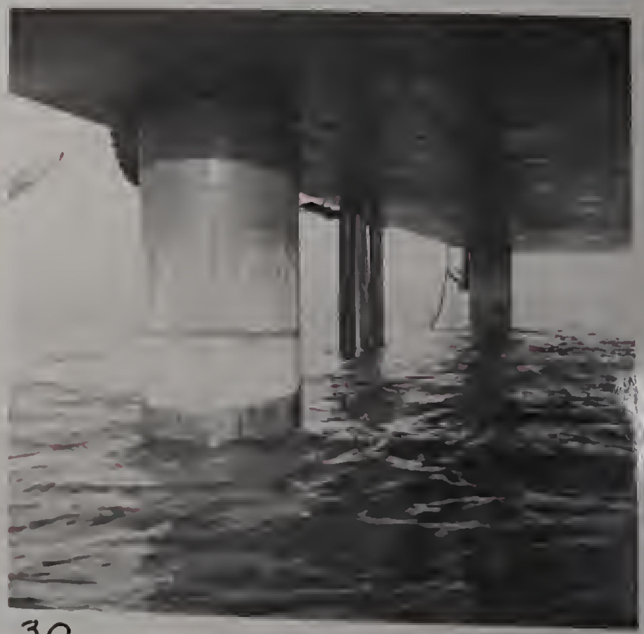
33 MAY 1963

500 ton air jack located at each corner of the jacking type barges. Caisons or "legs" are six feet in diameter.



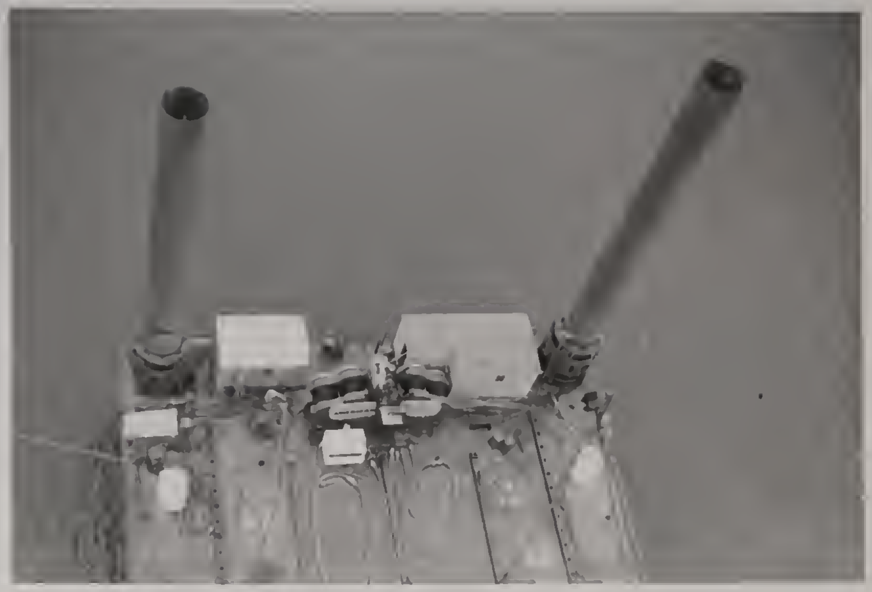
32 MAY 1963

Inside of the 500 ton air jack showing the slots for six rubber gripers in upper portion of jack. Lower portion also has six rubber grippers. Air cylinders are in closed position.



30 MAY 1963

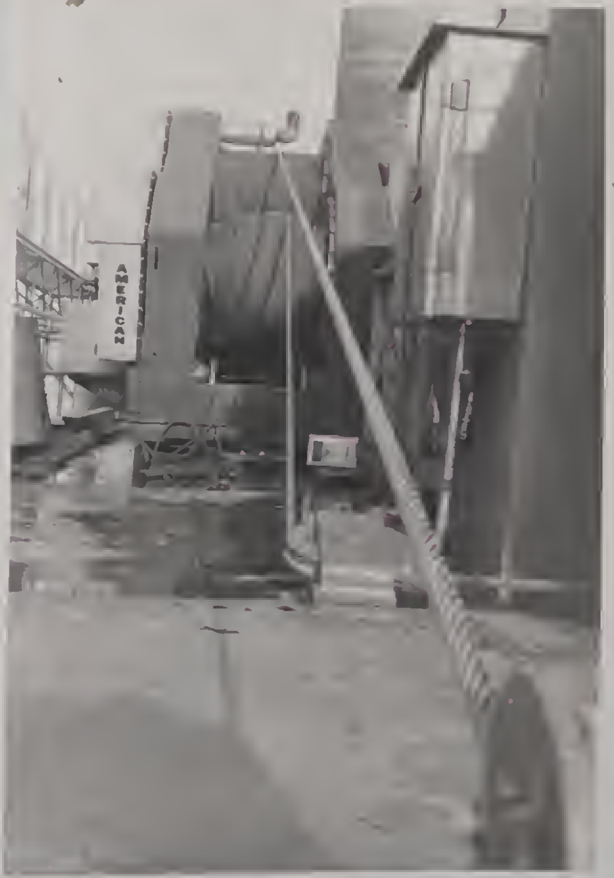
Underside of barge 159.



FEB 1963

35

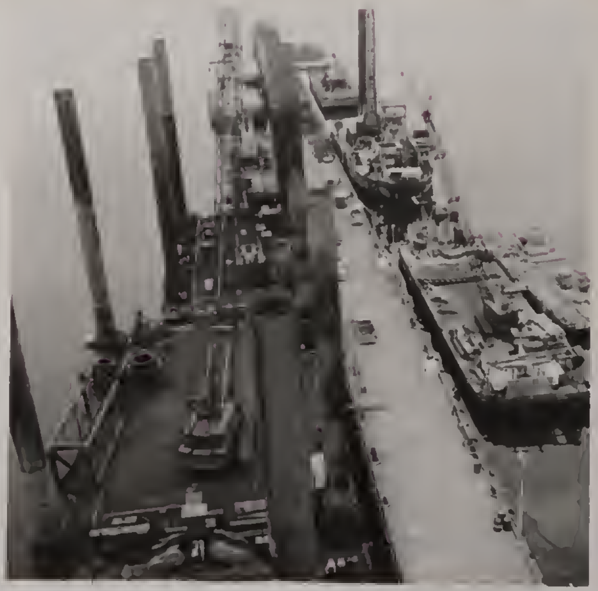
End of Barge 159 showing the American Hoist deck winch.



36

MAY 1963

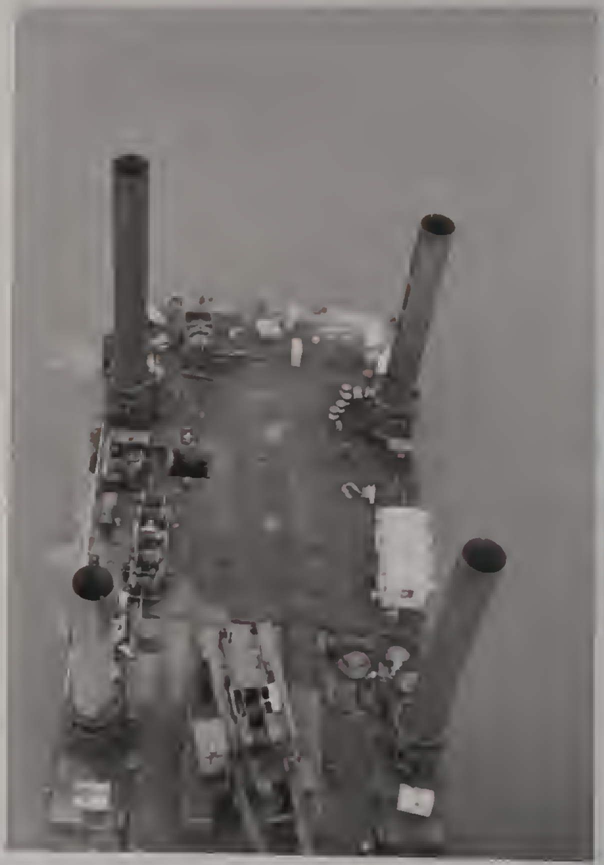
American Hoist deck winch on Barge 159.



34

MAR 1964

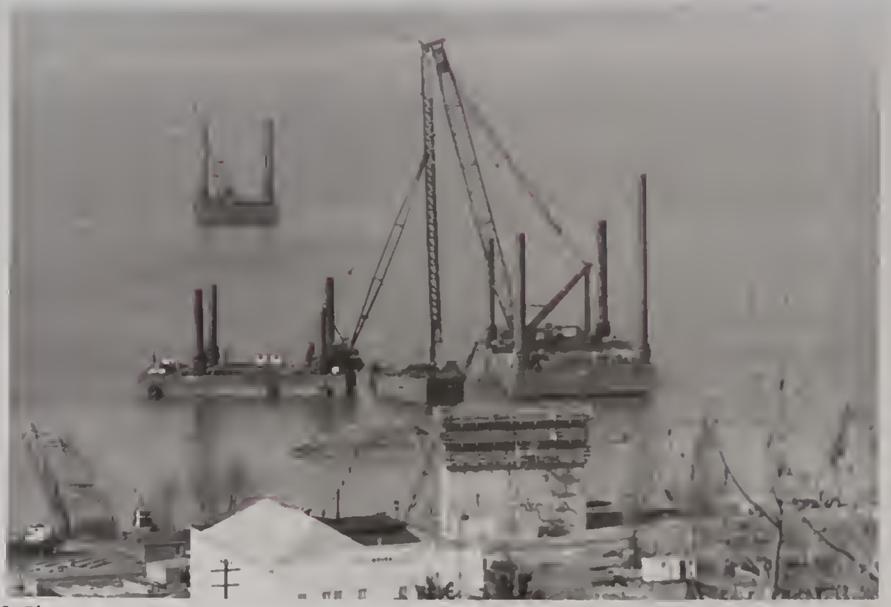
DeLong's floating equipment in moorage at Tongue Point after he stopped work on the project.



37

FEB 1963

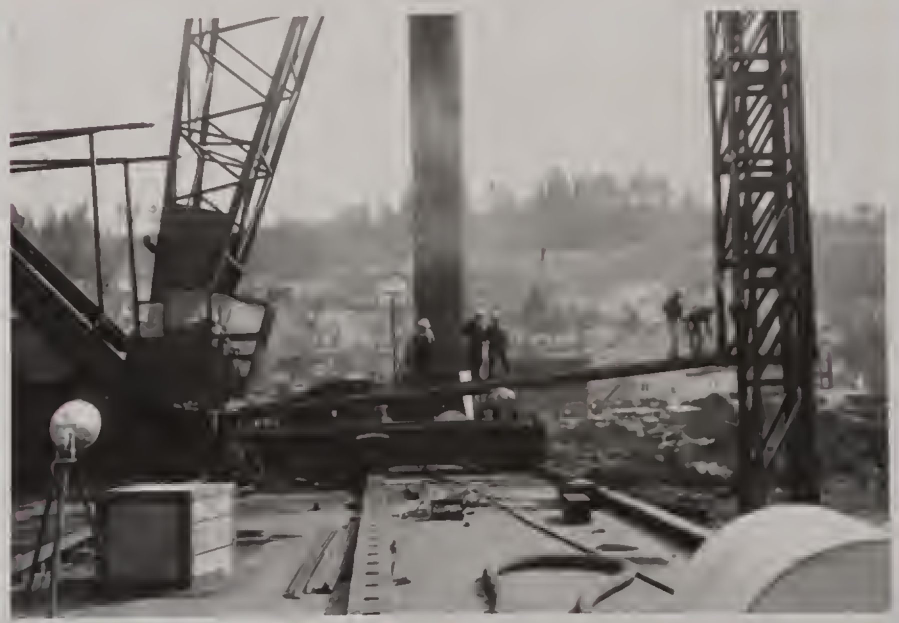
Barge 143 with Manitowck 4500, 100 ton crane.



MAR 1963

38

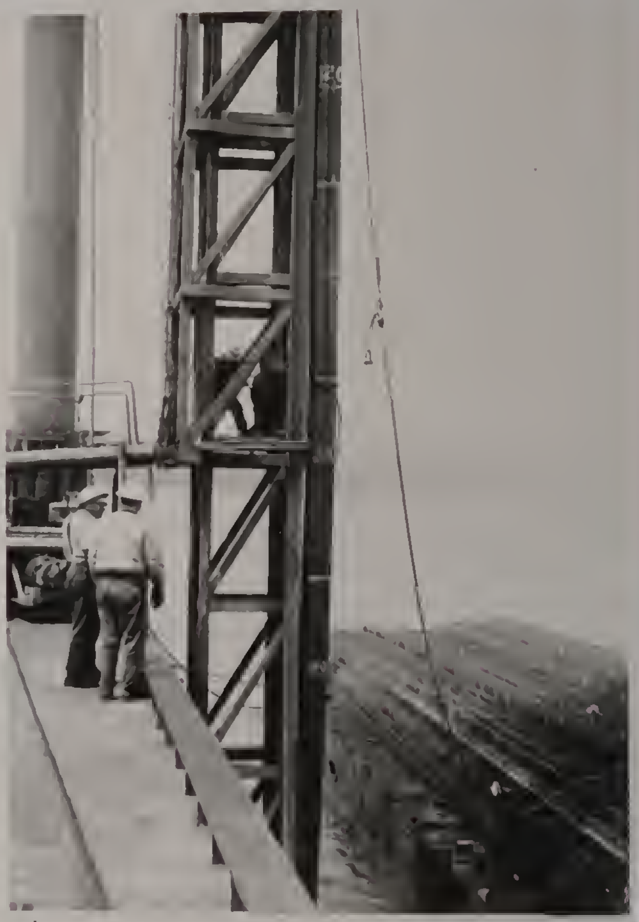
Barge 160 at pier 170 driving 14BP73 steel piles under water with a McKierman-Terry S-14 pile hammer. Barge 143 on left is handling the piles, which are located on tender barge in center.



MAR 1963

40

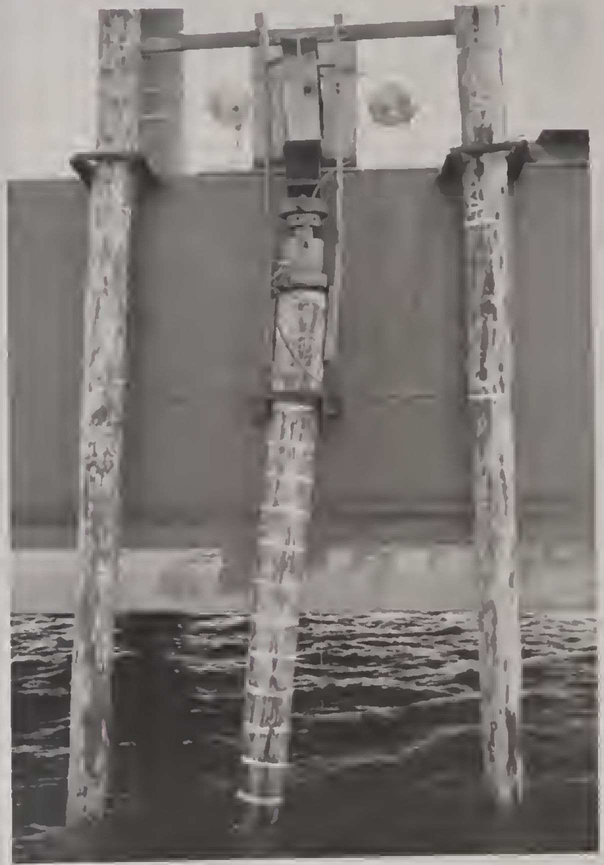
Stiff legs used to hold leads in rigid position. Crane moves both ahead & back, and right or left on greased rails.



41

JULY 1963

Pile driving superintendant Stan Plant and foreman Jack Johnson. Note telescoping pile leads which extend to river bottom.



42

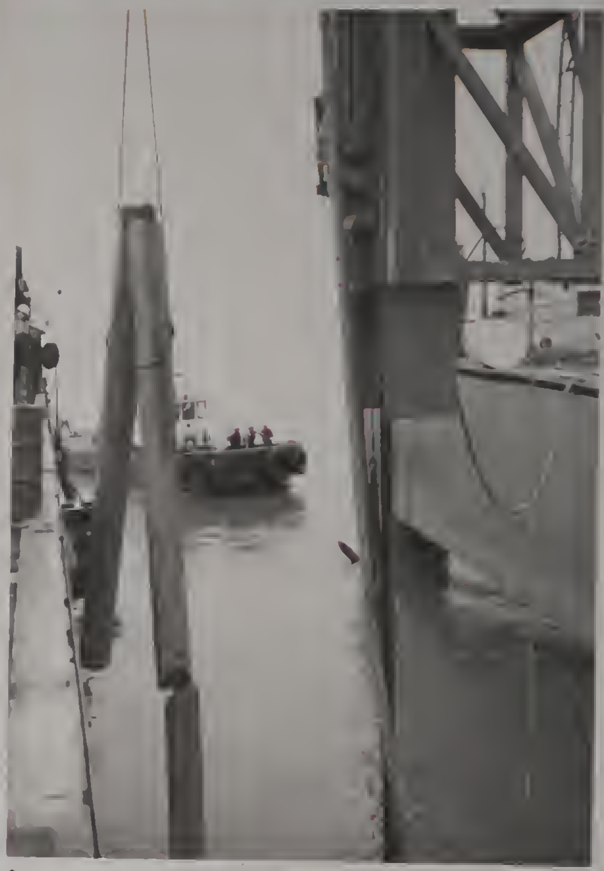
MAY 1963

Timber test pile at pier 165. 250 ton hydraulic jack used for load. 36 inch I beam welded to deck of barge 159 was used for a reaction. Pile failed in bending due to unsupported length.

43

FEB 1963

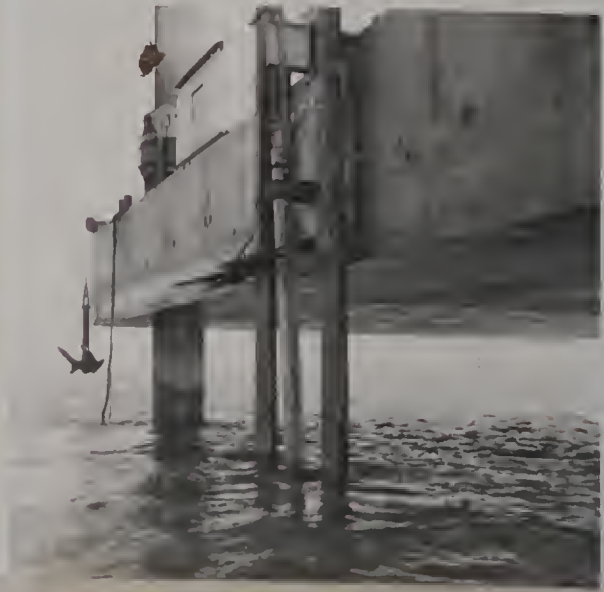
Driving of the second test pile was successful.



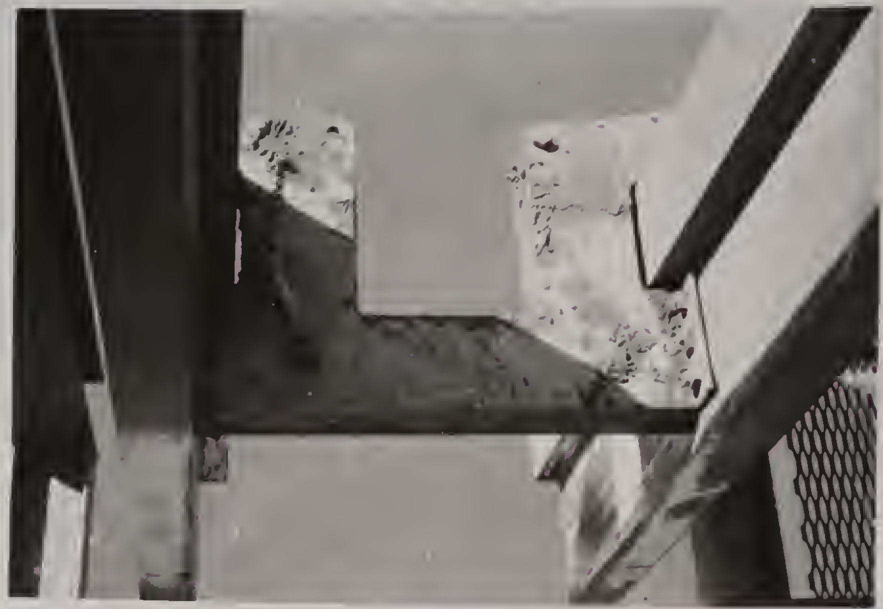
45

MAY 1963

The first 14 inch prestressed concrete test pile (120 ft. long) broke during driving.



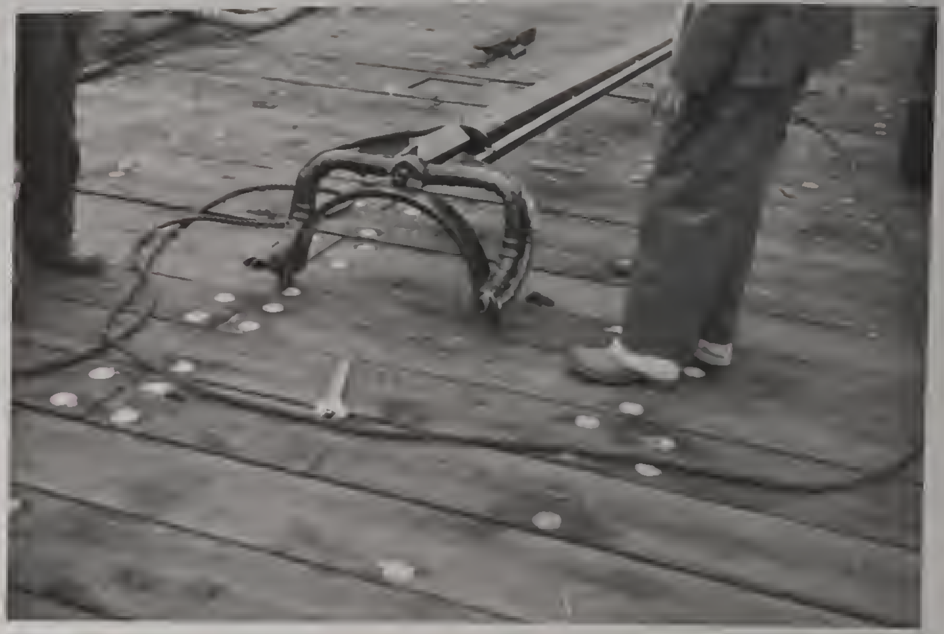
The pile was loaded with a 250 ton hydralic jack. A 36 inch I beam welded to the deck of the barge 159 was used for a reaction. The two steel piles are for reference elevation only.



MAR 1963

47

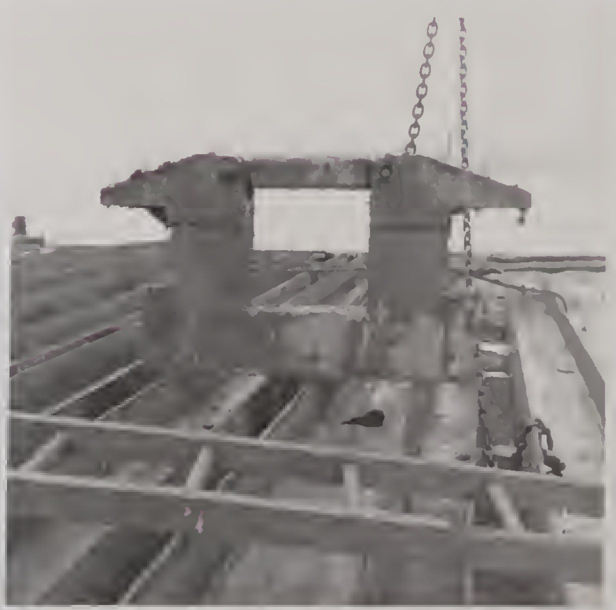
47 Pile gate or "guide" at the bottom of the telescoping leads to guide the pile to proper location.



MAY 1963

49

One of the first jet systems attempted. There were thre water jets and two air jets. This was not successful du to the low volume water pump on hand at the time.

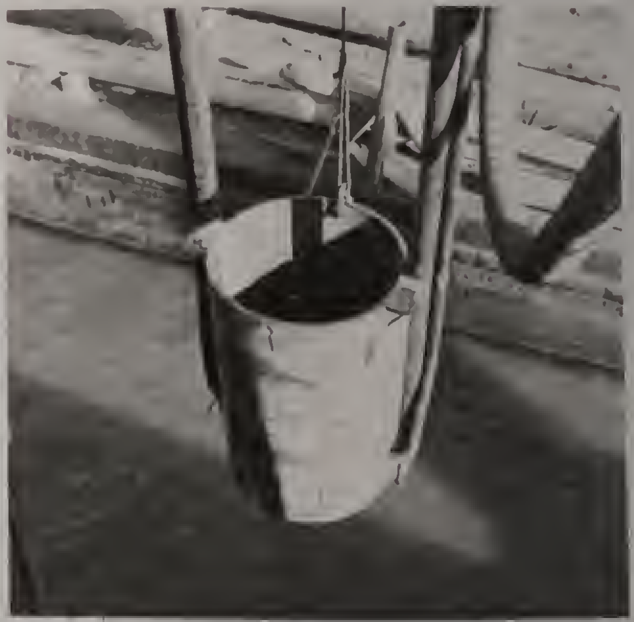


48 MAY 1963

Occasionally while driving underwater, the leads would not be lowered far enough, and the S-14 hammer would drive the pile gate off before they could stop it. This pile gate was just recovered from the river bottom.

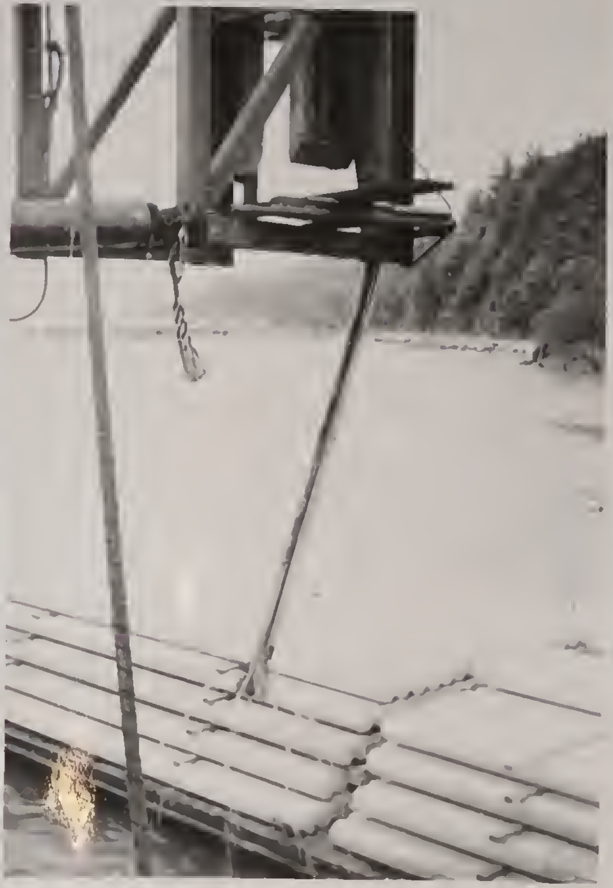
53 MAY 1963

Occasionally the single jet required repairs.



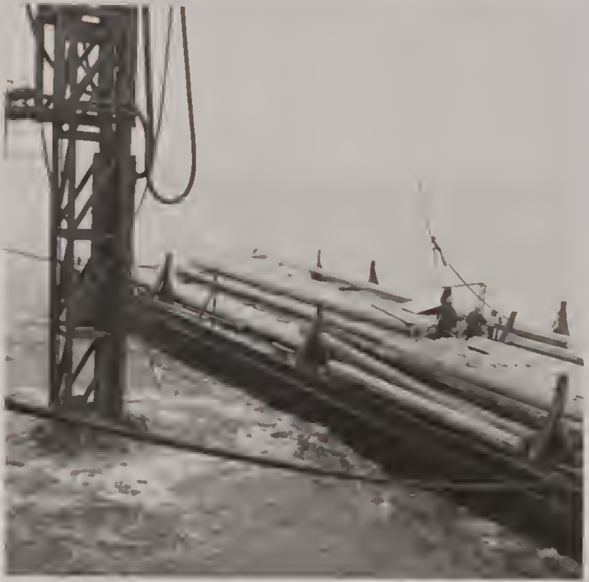
52 MAY 1963

A steel cylinder wased in conjunction with t in an effort to "liout" the sandy material. only moderately sucful and its use was aband



51 JULY 1963

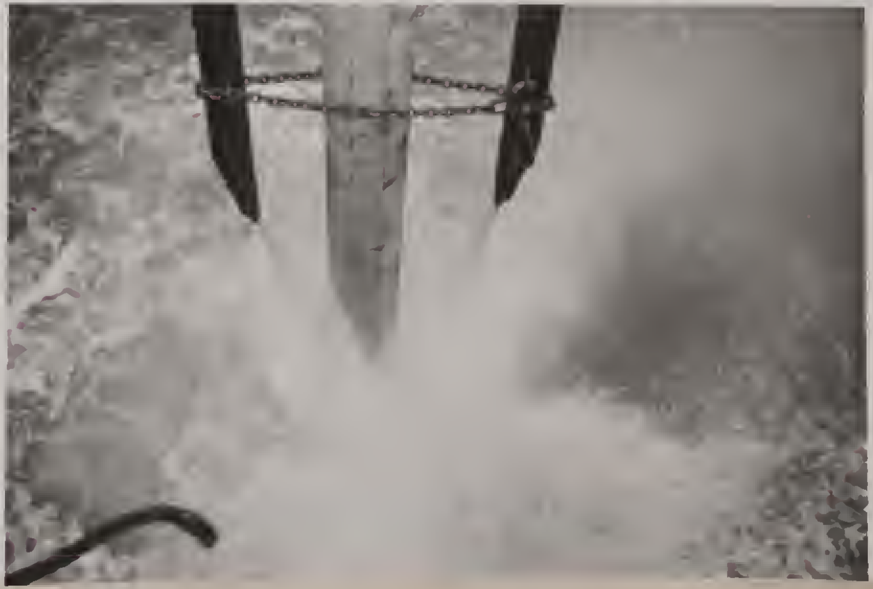
Single jet used for most piles at pier 7 thru 20. The jet would be run down to a specified elevation first. The pile would then be placed in the hole and driven without further jetting.



60 MAY 1963

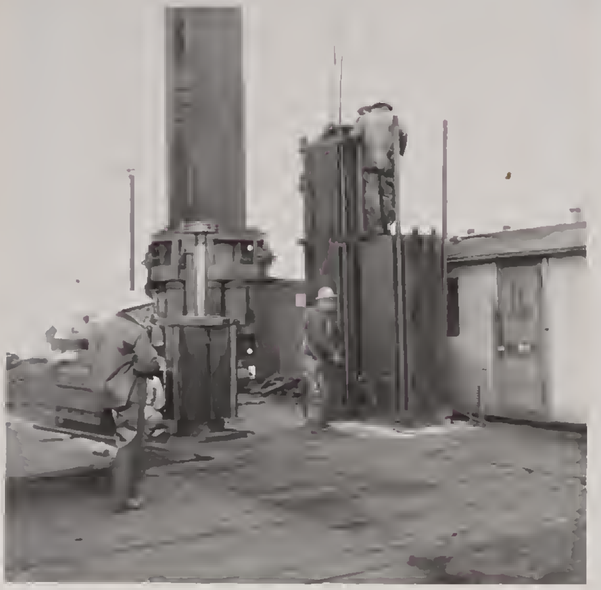
Note turblance at surface while jets are operating about 60 feet below the surface.

54 JULY 1963



MAR 1963

Double jet used for driving most of the piles at pier 160 thru 167. There were two air jets and two water jets. Each water jet had a 300 psi, 1200 gpm pump outlet through a 1½ inch nozzle. The air jets had a 1 inch nozzle and operated at 110 psi.

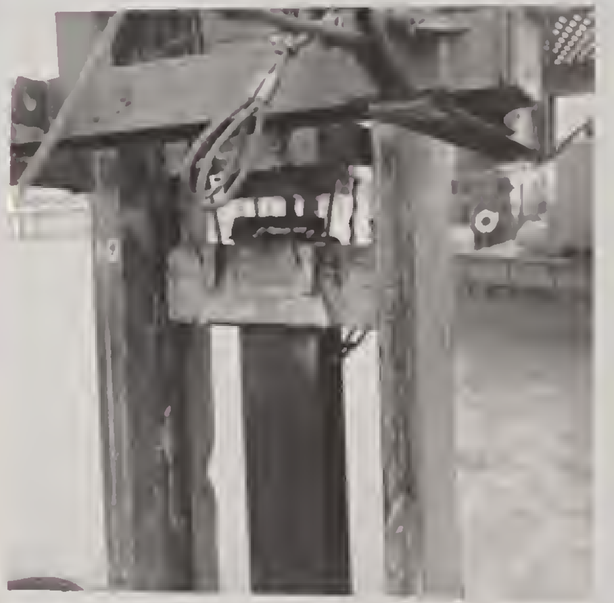


62 MAY 1963

The two McKiernan-Terry S-14 underwater air hammers used on the project. One hammer is disassembled for repairs.

MAY 1963

67

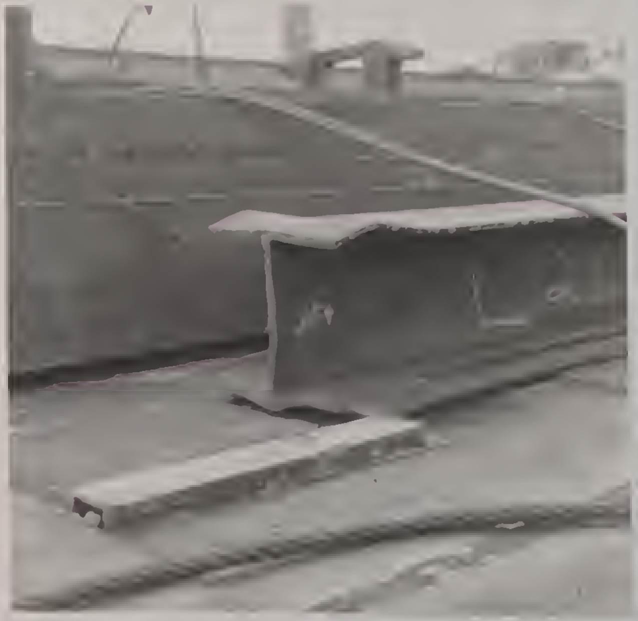


55 MAY 1963

Unless reinforced, the pile heads would often fail. The pile had to be cut off underwater before hammer could be raised.

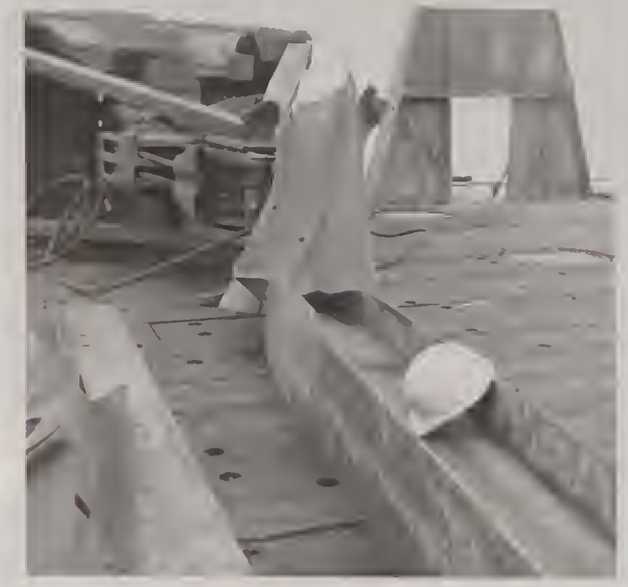
56 MAY 1963

Pile buck burning out damaged pile head.



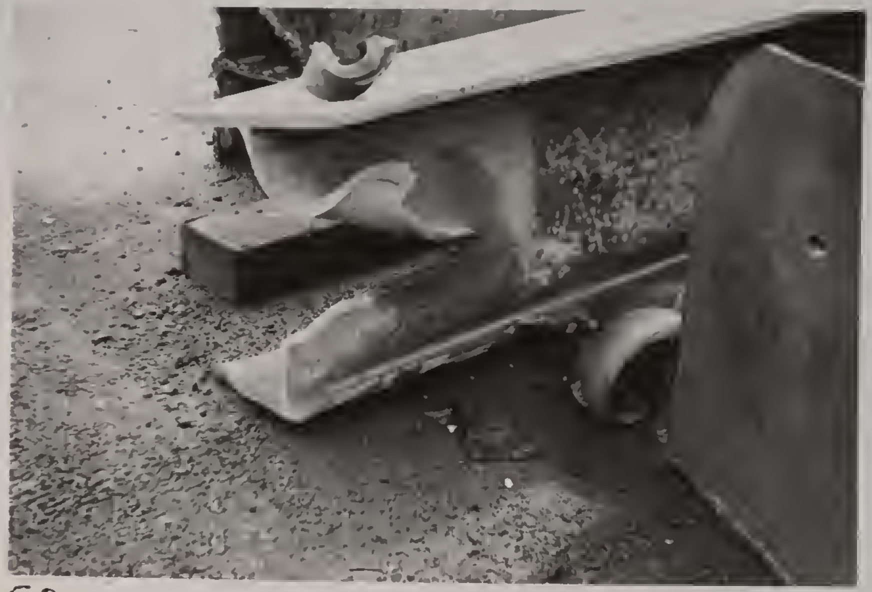
51 MAY 1963

Typical of the many moderately damage 14BP73 pile heads at pier 170.



59 MAY 1963

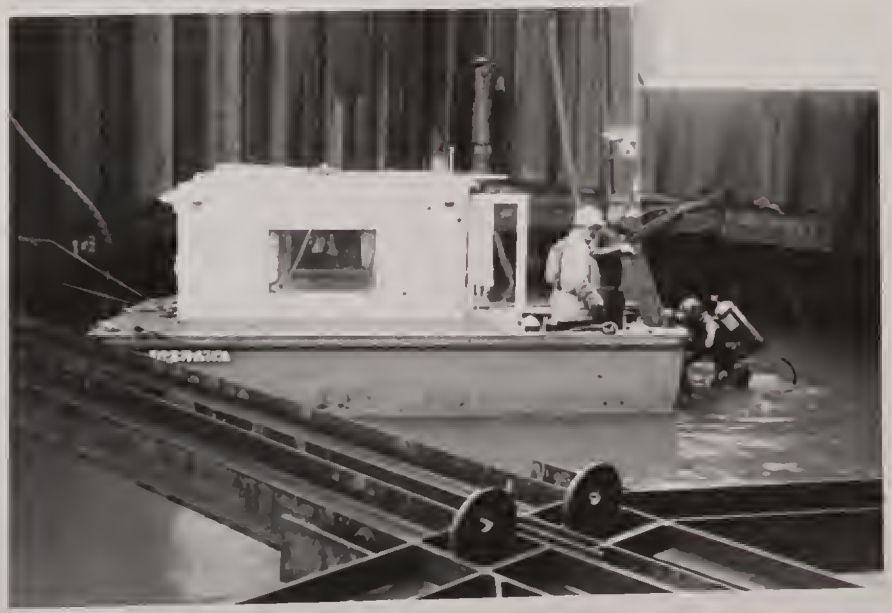
This pile cutoff was damaged by a clam shell while "fishing" for a lost pile gate.



MAY 1963

58

This pile was hit by the pile hammer while driving an adjacent pile.

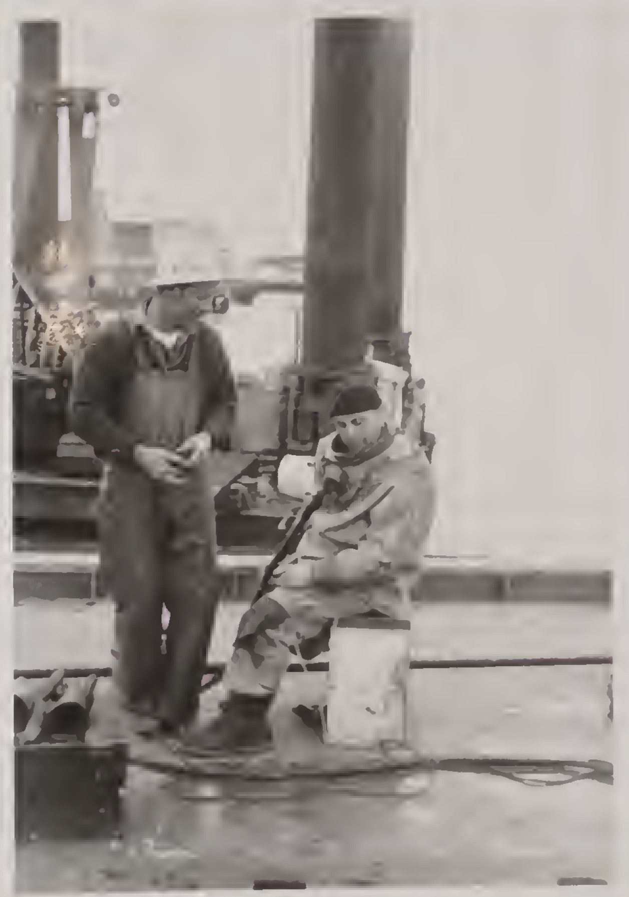


MAY 1963

68

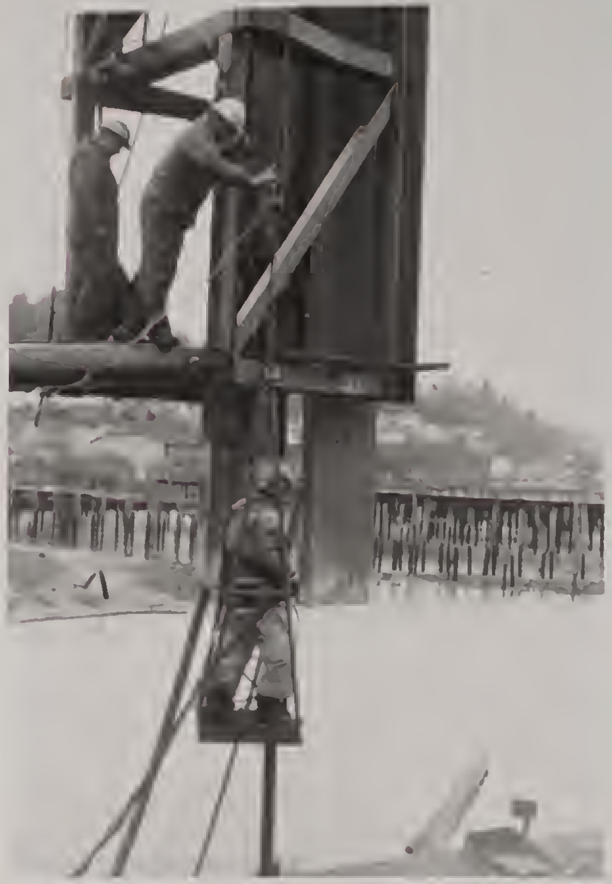
Ed Forsyth of "Commercial Divers" making an inspection at pier 170 for the state.

Diving skow used by state divers.



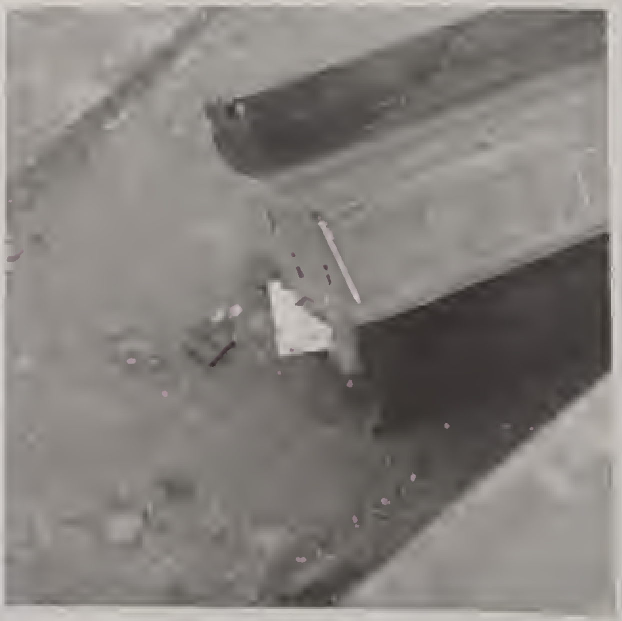
63 FEB 1963

The contractors used hard hat divers for about half of their under water work. Jim Colby shown here with his tender.



64 FEB 1963

Platform used to lower diver from barge deck into the water.

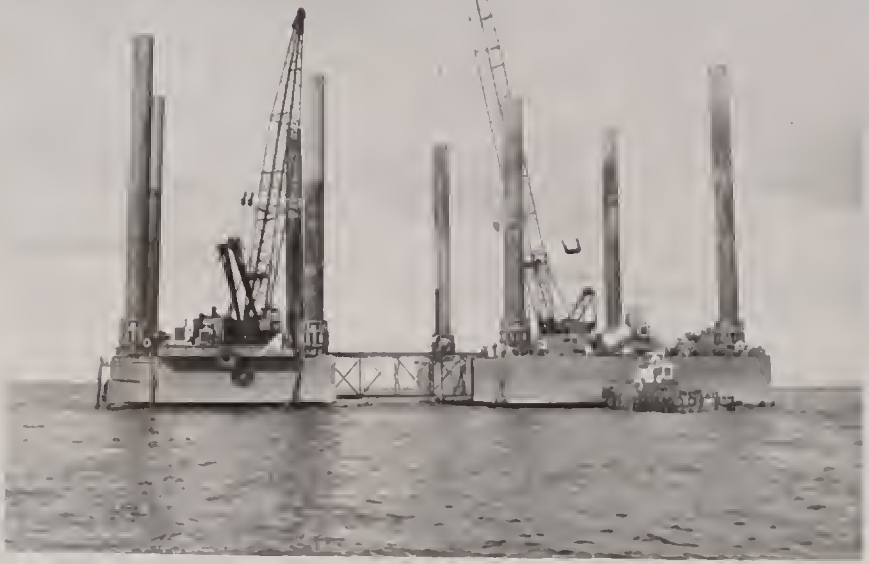


66 MAY 1963

Typical of an under water cutoff made by a diver with an oxygen-arc cutting torch. The electrode has a hole in the center for the oxygen.

65 FEB 1963

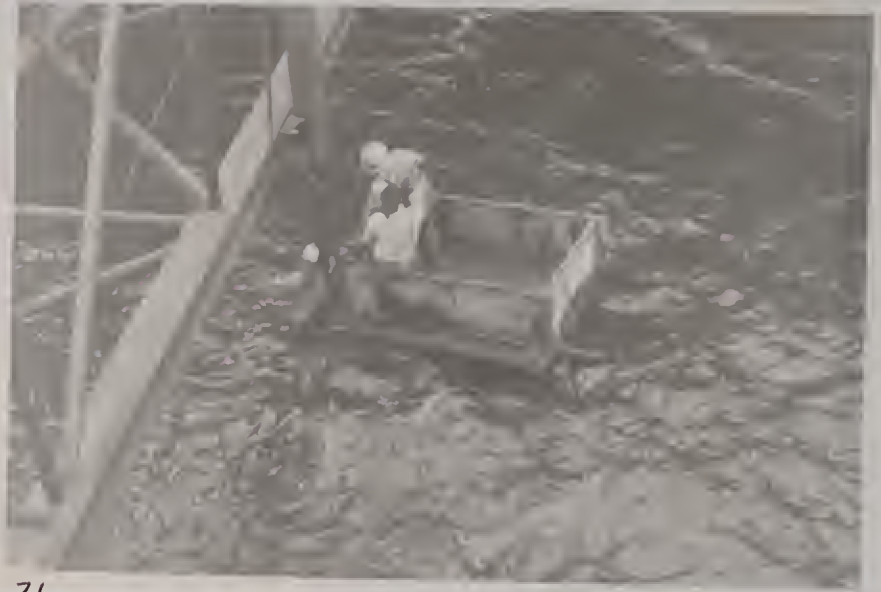
Diver's tender with telephone communications with him.



AUG 1964

69

Barge 143 and 159 set up to excavate and make underwater false pile cut offs.



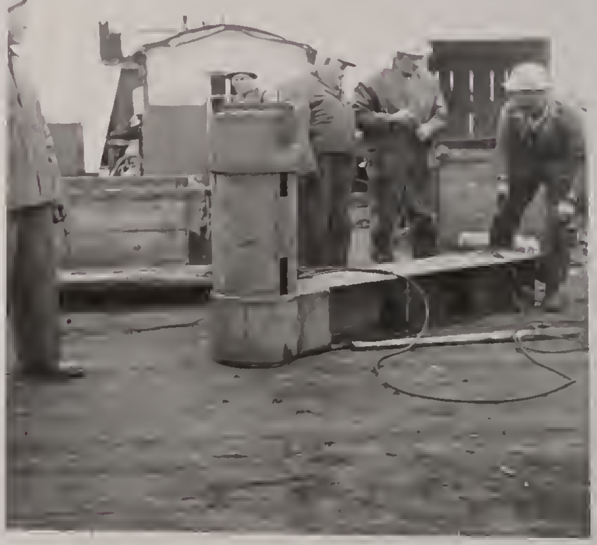
AUG 1964

71

Air operated chain saw which swivels on bottom of pipe to make underwater false pile cutoffs.

AUG 1964

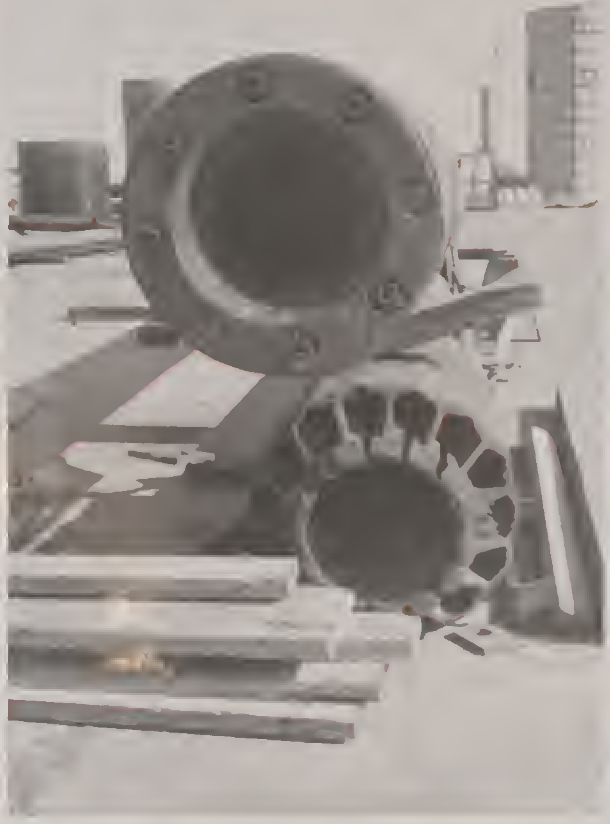
Falsecaps were placed across two false piles to form one support. The precast shells were set on 4 or 5 of these supports.



73

MAR 1965

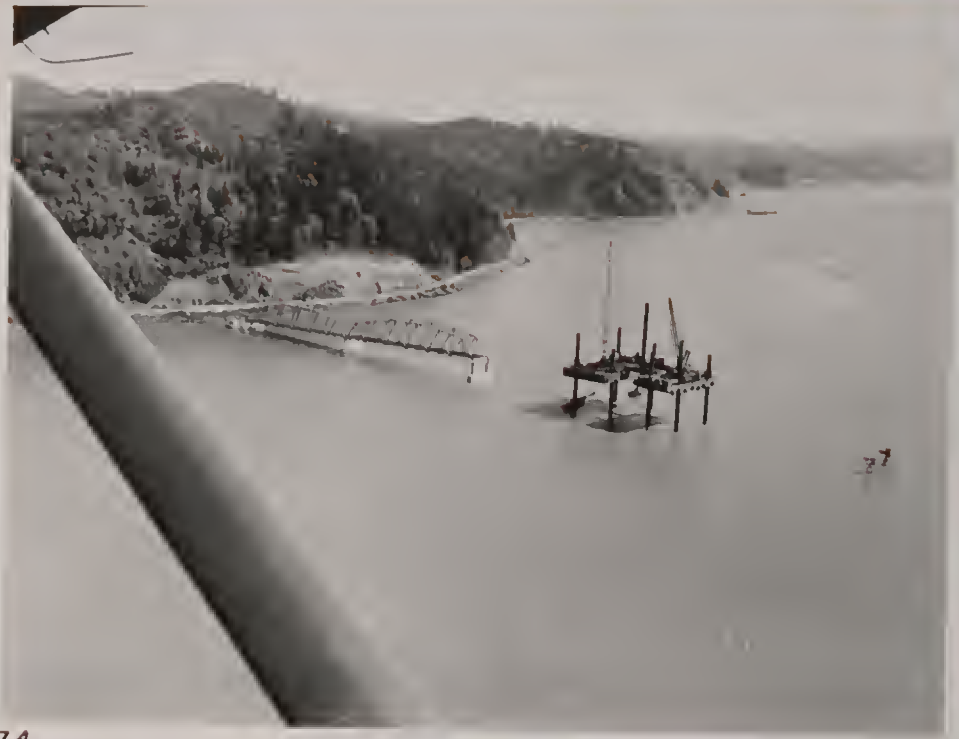
A special falsecap was fabricated in order to utilize a foundation pile where an interior falsepile had been broken.



70

OCT 1964

Bottom end of 14 inch air lifts used to excavate for bell type piers.

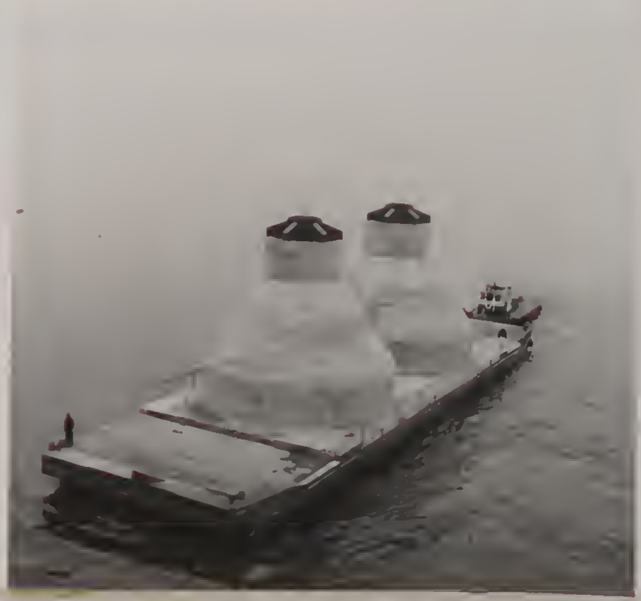


74

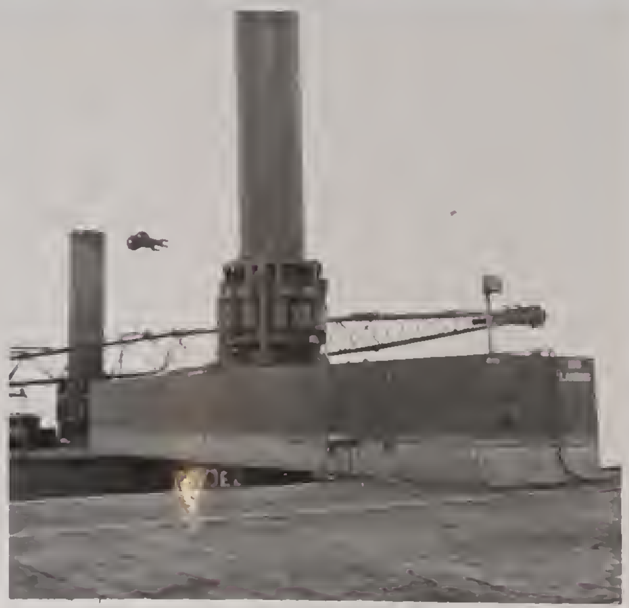
Barges 143 & 159 jacked up ready to set pier 8 precast shells.

75

AUG 1963

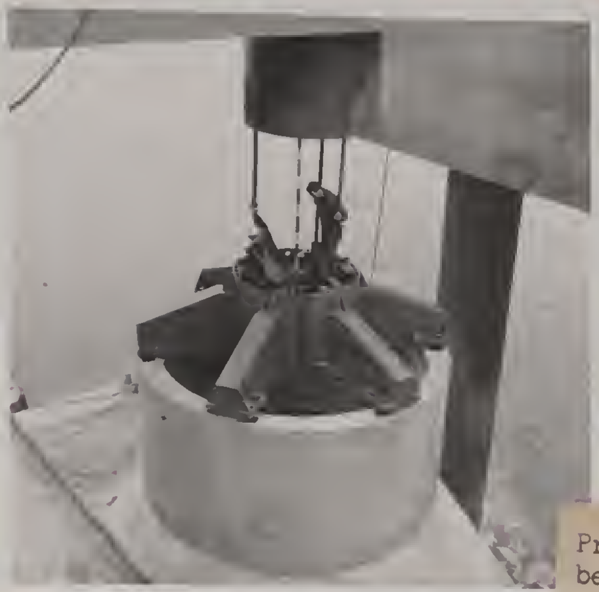


Precast shells for pier 164 with spreaders bolted to lifting inserts in top of shells. Triangulation crew sighted range poles for final position adjustments.



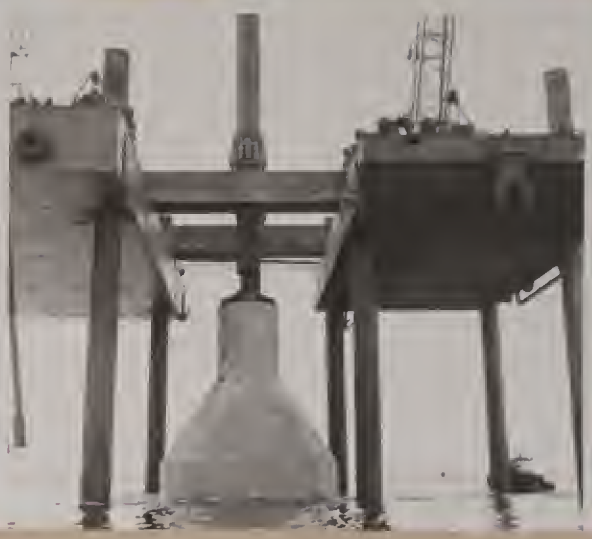
77 AUG 1963

Lifting girder placed between barges 143 & 159. 800 ton air jack is placed over 6 ft. diameter well in girder.

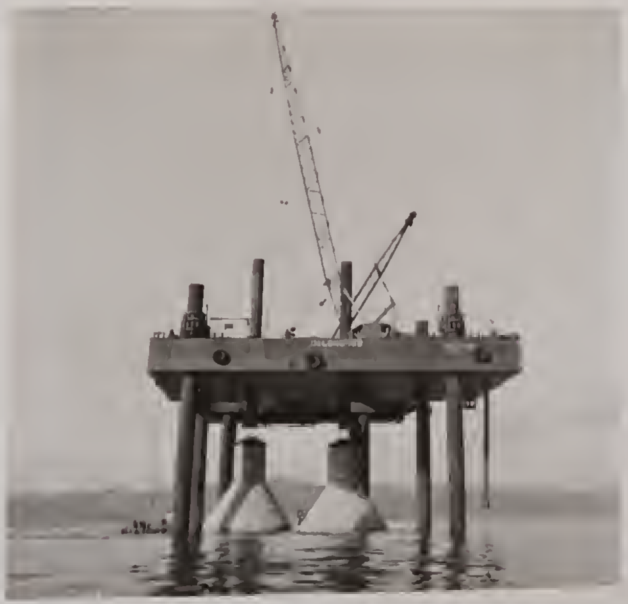


78 AUG 1963

Lifting caisson being hooked up to spreader.

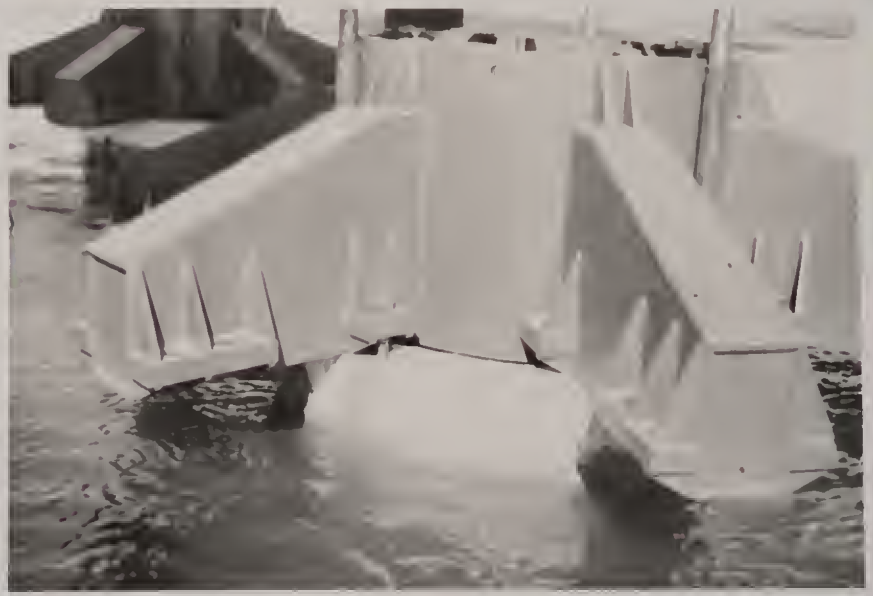


Precast shells have been lifted off the barge and are being lowered to river bottom.



80 NOV 1963

Precast shells for pier 164 being moved to pier location.



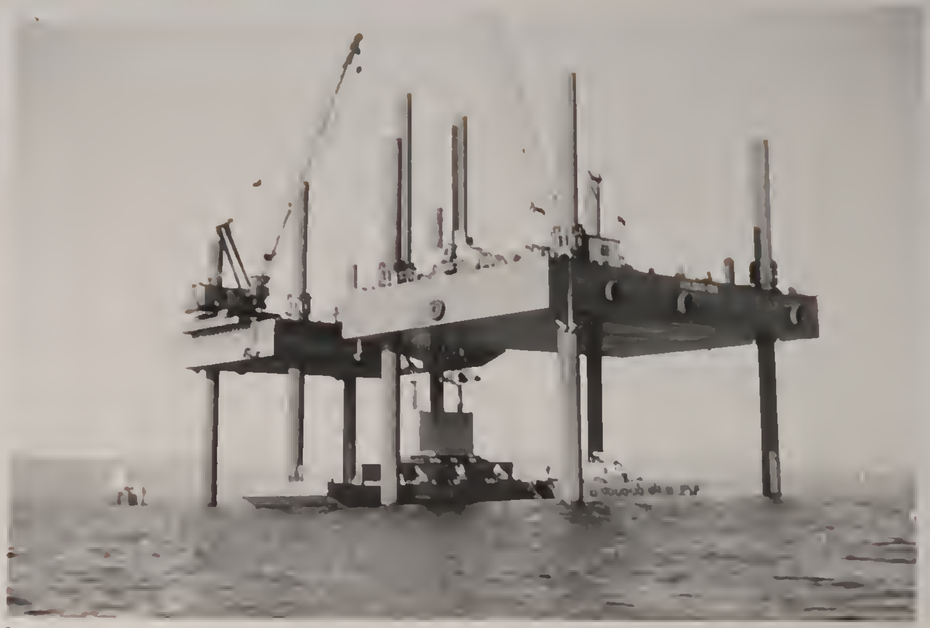
81 JUNE 1963

Precast shells in final position.

AUG 1963

82

A precast cap enroute to pier location.


AUG 1963

83

Barges 143 & 159 jacked up and ready to lift cap off of barge.

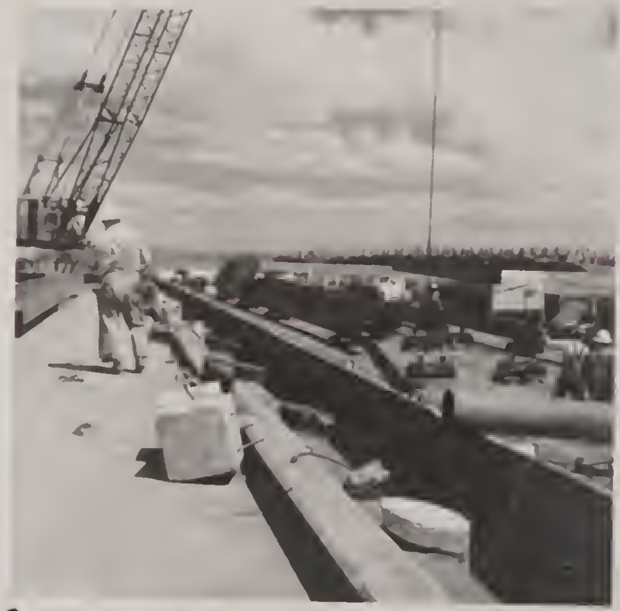
84 AUG 1963

85

Epoxy grout is being applied to top surface of precast shell. (Precast shell has already been filled with tremie concrete.)

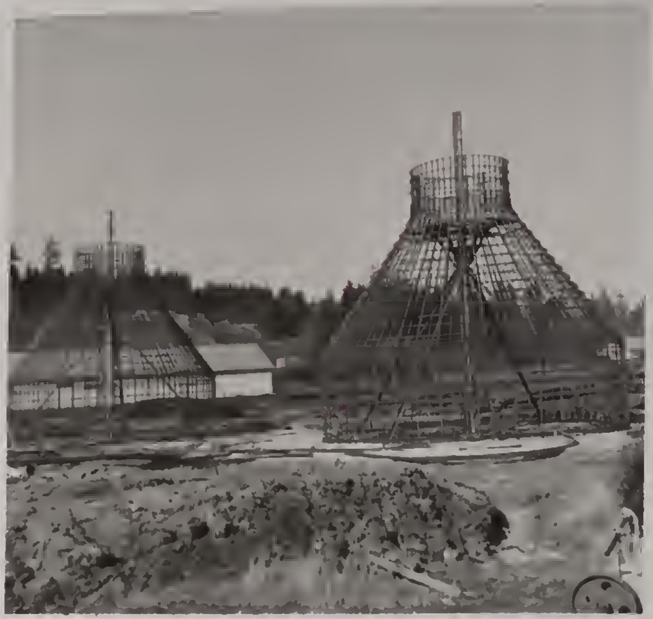
87 MAY 1963

Contractors precasting yard and batch plant at Tongue Point.



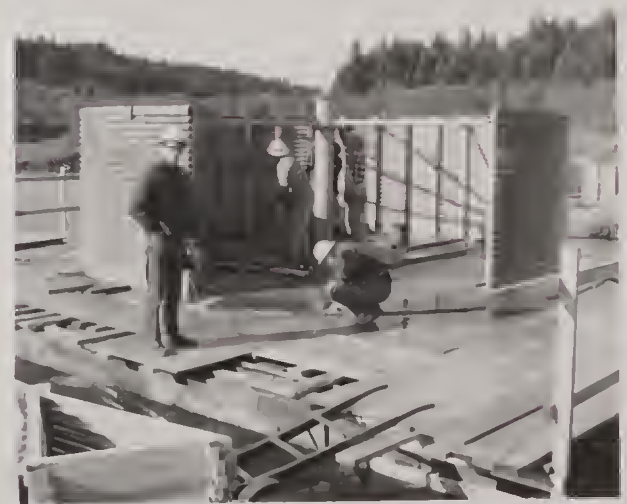
88 JULY 1963

Jigs for splicing 14BP73 piles into lengths up to 210 feet.



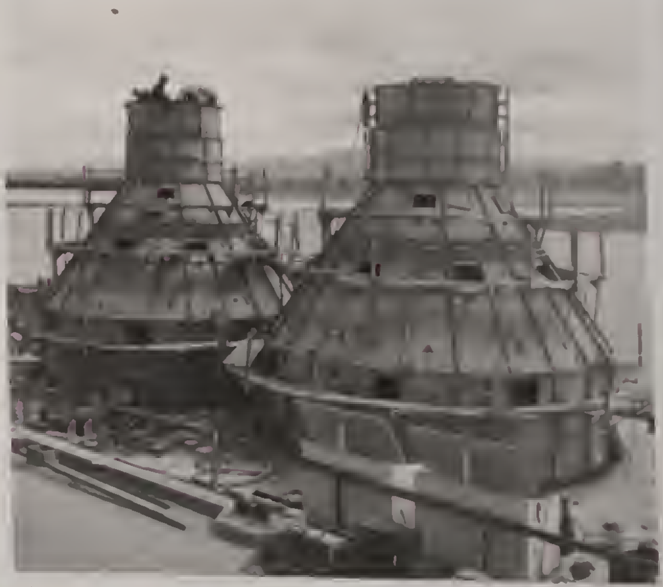
89 MAY 1963

Reinforcing steel for the pier shells was tied around these frames and then moved to the barge and set over the interior forms of the shells.



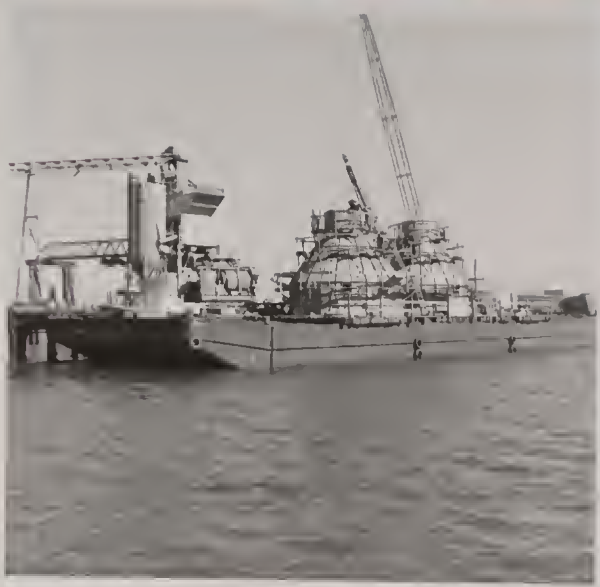
90 MAY 1963

Interior forms of lower portion of pier shell are being erected on a barge. Darryl Devnich inspecting.



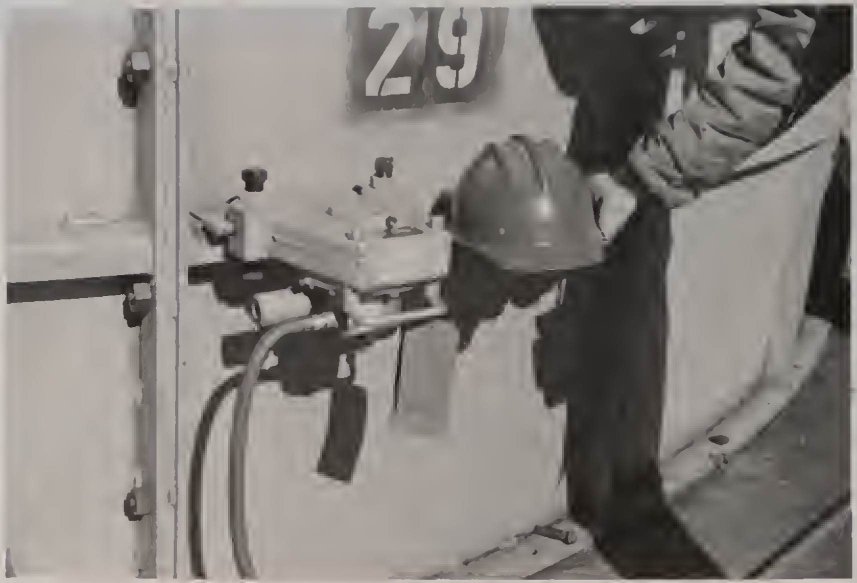
91 JULY 1963

Shell forms nearly complete for pier 160. Windows are for pouring concrete.



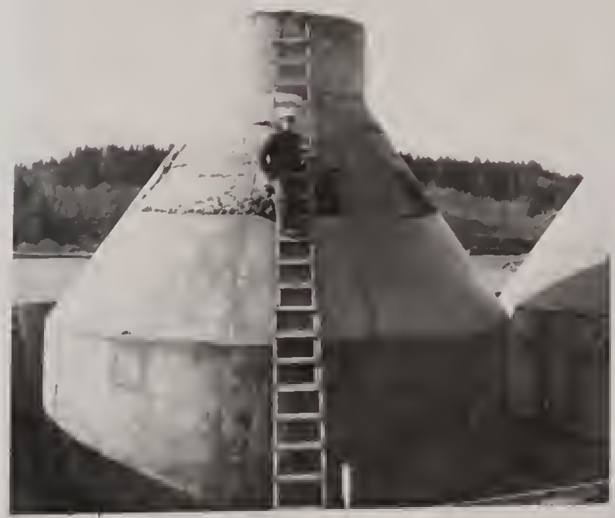
92 MAY 1963

Pier 160 shells at batch plant ready for pour.



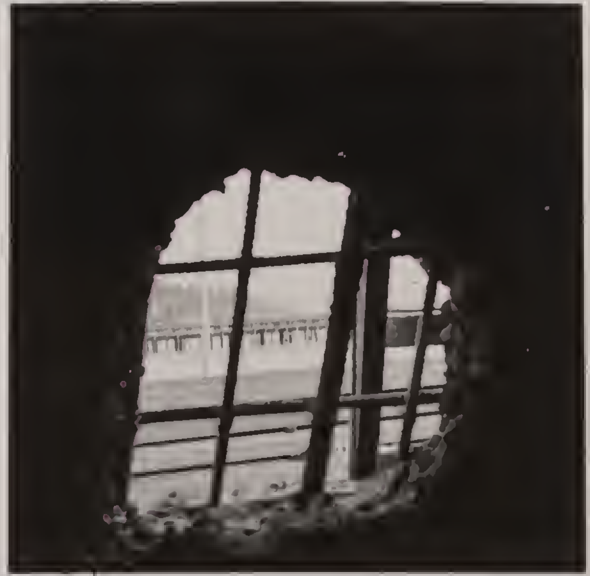
93 1963

Form vibrators used on pier shell forms.



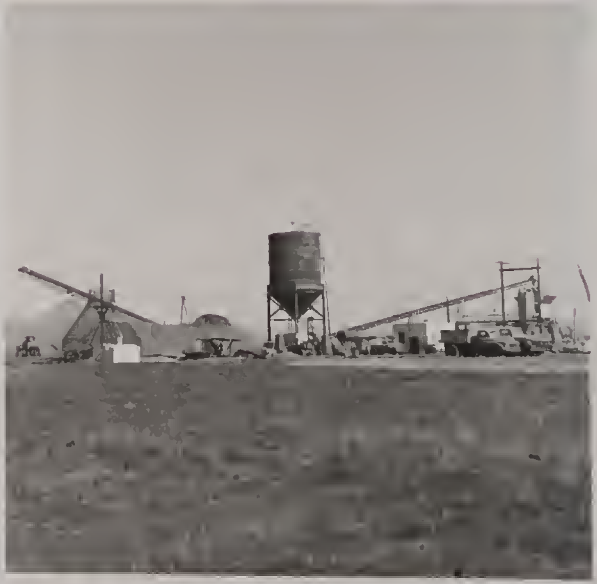
94 MAY 1963

Vibration was not adequate on the first pour.



95 MAY 1963

A bad rock pocket.

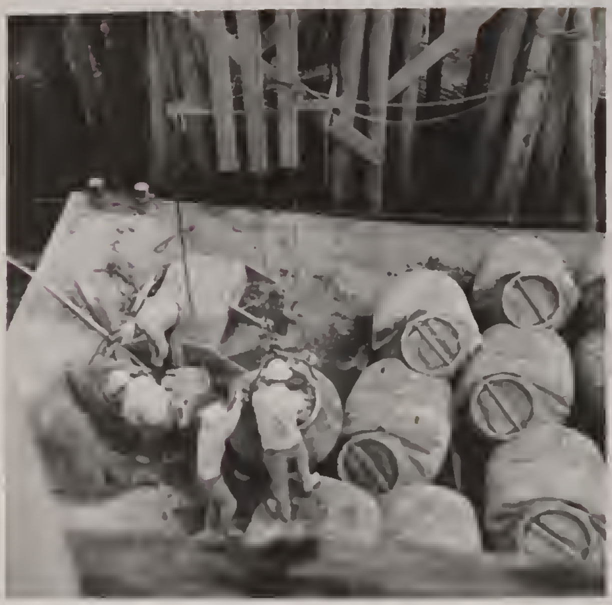


96 MAY 1963

DeLong's batch plant at Tongue Point.

97

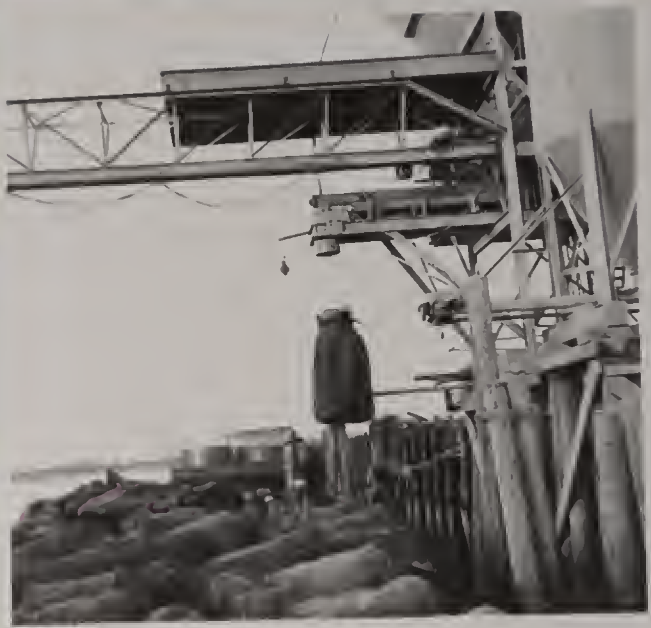
1963



100

JUNE 1963

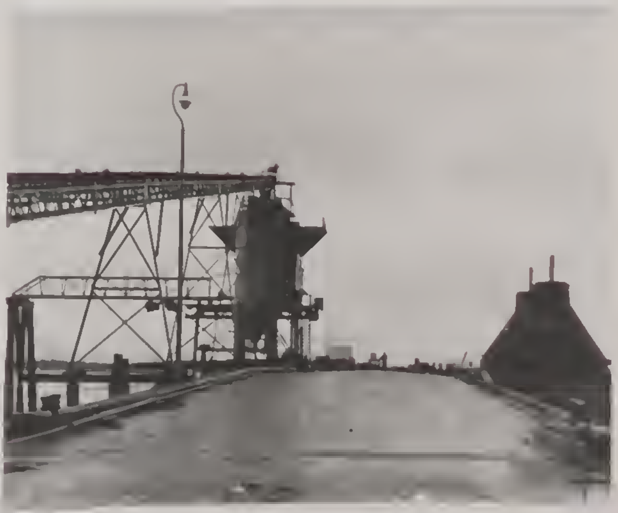
Roto-bags being lowered on to barge.



99

JUNE 1963

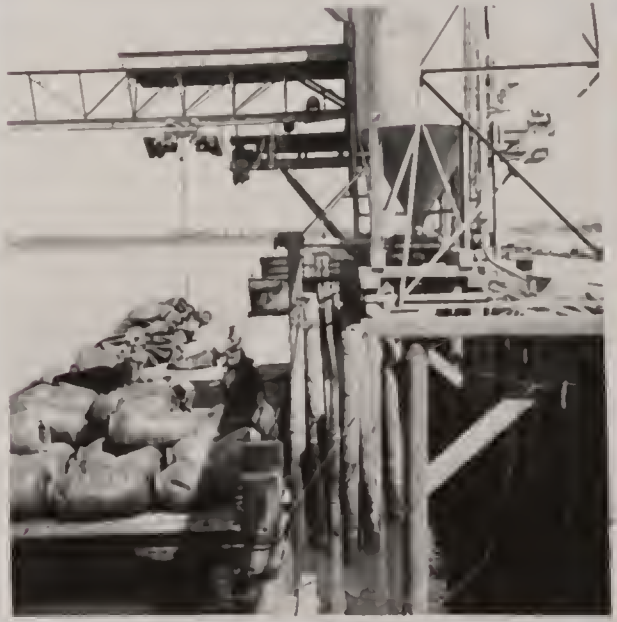
Roto-bags were used by DeLong for concrete pours at the bridge site. Each bag was loaded with 1½ cubic yard dry batch. Cement was put in separate compartment in bag.



98

MAY 1963

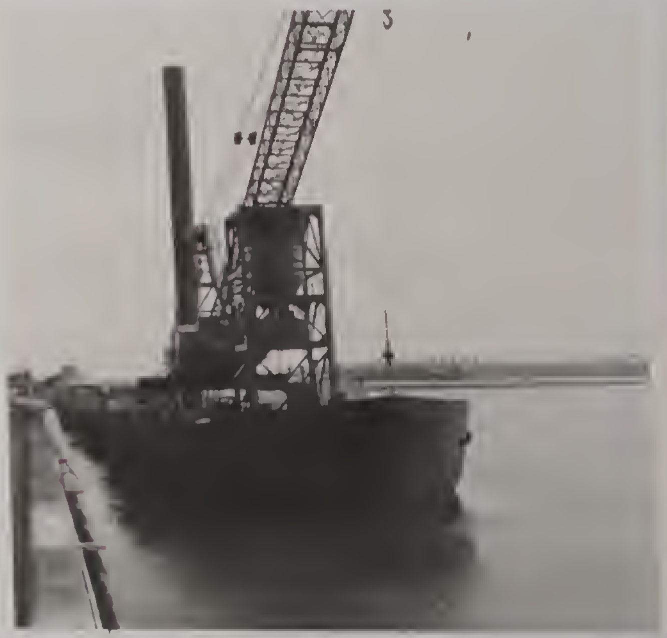
Conveyor which carried aggregate to the batch plant. Pier 160 interior shell forms at right.



101

JUNE 1963

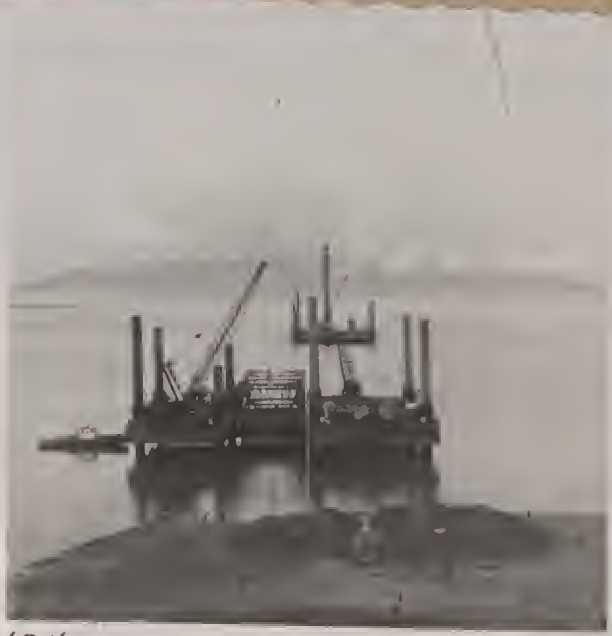
Empty roto-bag being fitted with special adapter prior to batching.



102

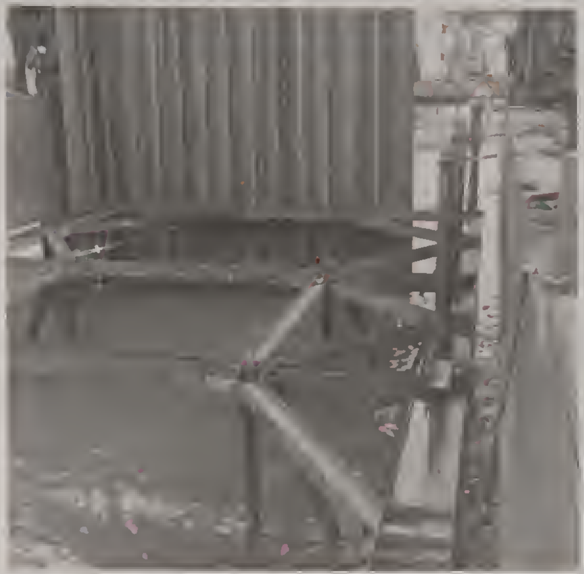
MAY 1963

Mixing barge used by DeLong at Bridge site. Two roto-bags were emptied into hopper. A 3 cubic yard turbine mixer is just below hopper.

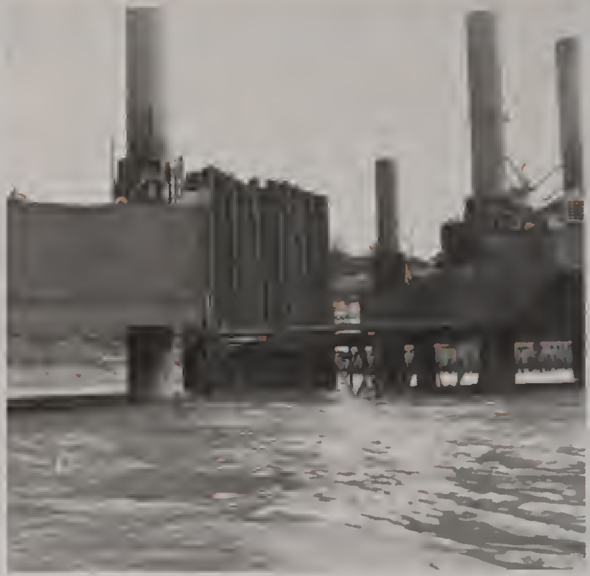


104 APR 1963

Barges 143 & 159 setting wale frame for pier 170 cofferdam. Barge 160 driving piles at pier 169.

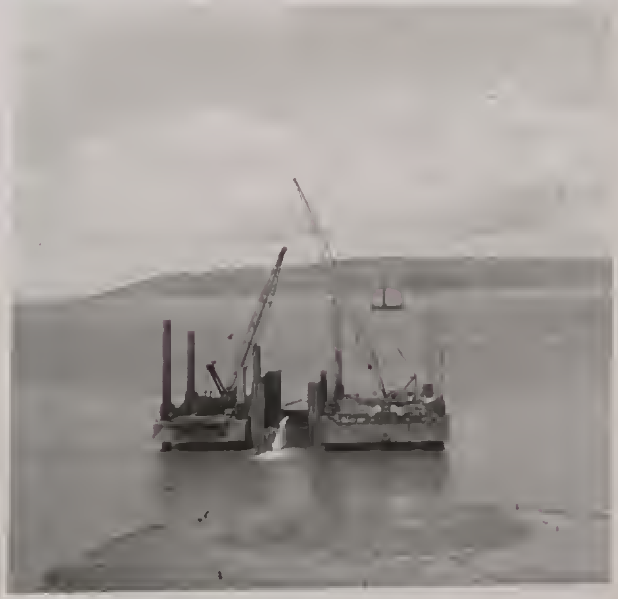


105 MAY 1963



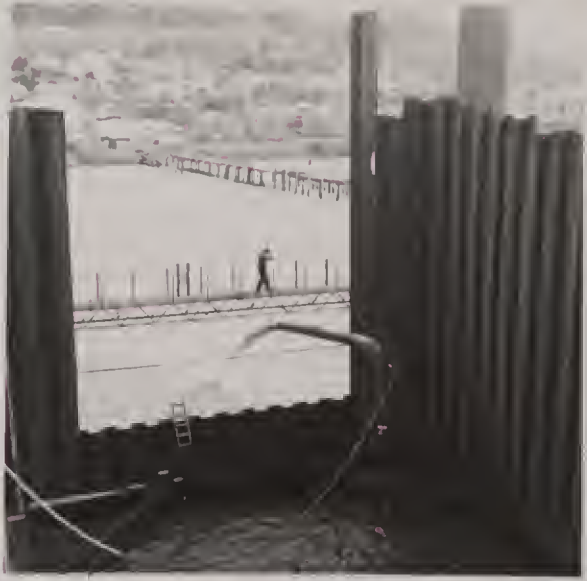
106 MAY 1963

Driving sheet piles at pier 170. Cofferdam was 45 ft by 89 feet.

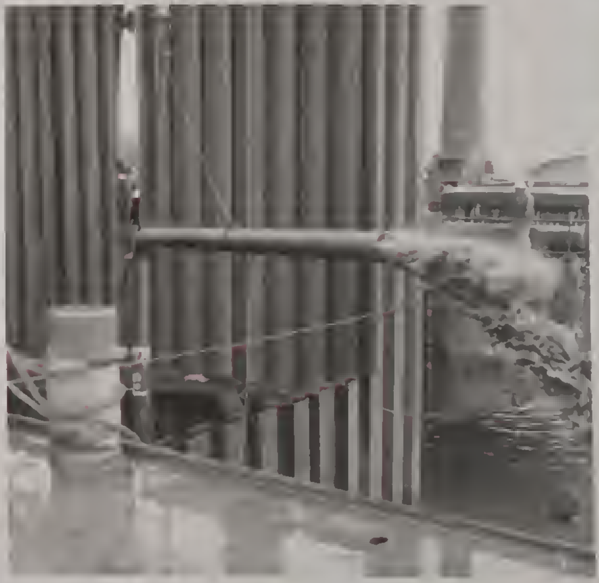


107 MAY 1963

Excavating inside pier 170 cofferdam with 12 inch air lifts.



108 MAY 1963



109 MAY 1963

12 inch air lifts excavating at pier 170.

111 JAN 1964

Pier 169 cofferdam.

JAN 1964

112

Considerable time was spent sealing leaks in sheet piles.

113 JAN 1964

Sump for pump inside pier 169 cofferdam.

114 JAN 1964

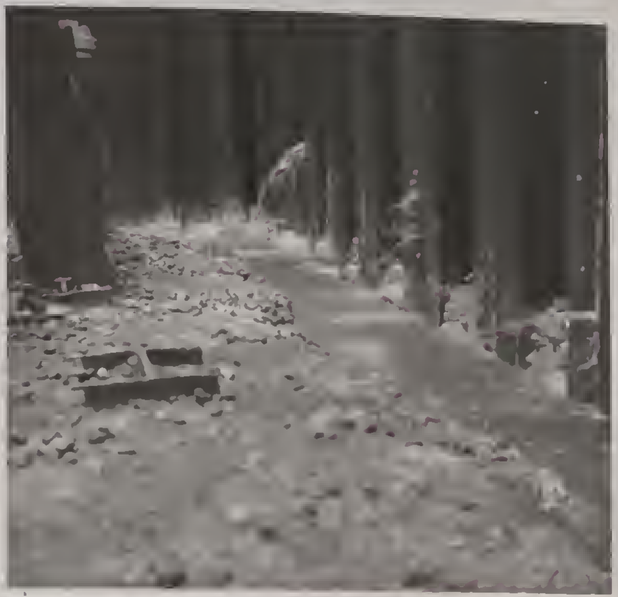
Excessive amounts of laitance were found on surface of seal.

115 JAN 1964

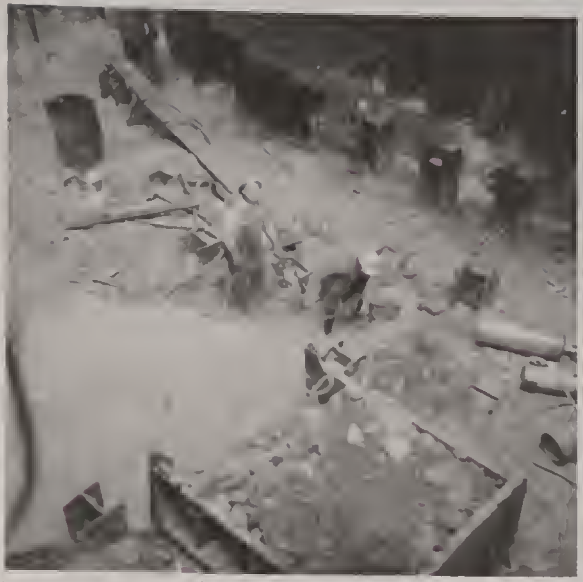
Laborers cleaning out laitance

116 JAN 1964

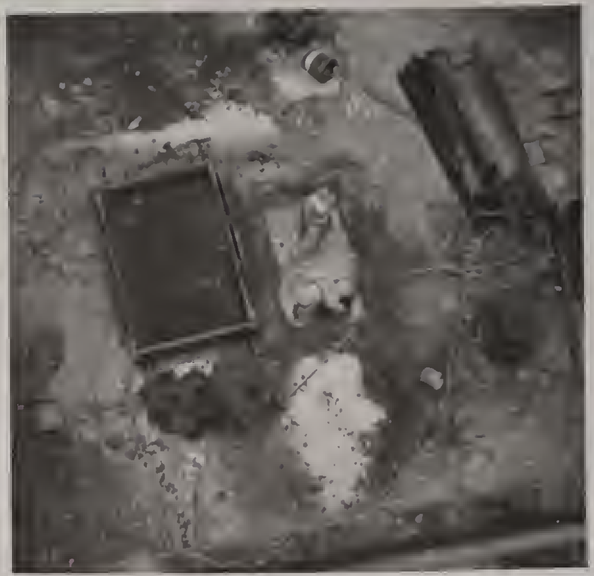
Some sheet piles were driven several feet out of plumb.


117
JAN 1964

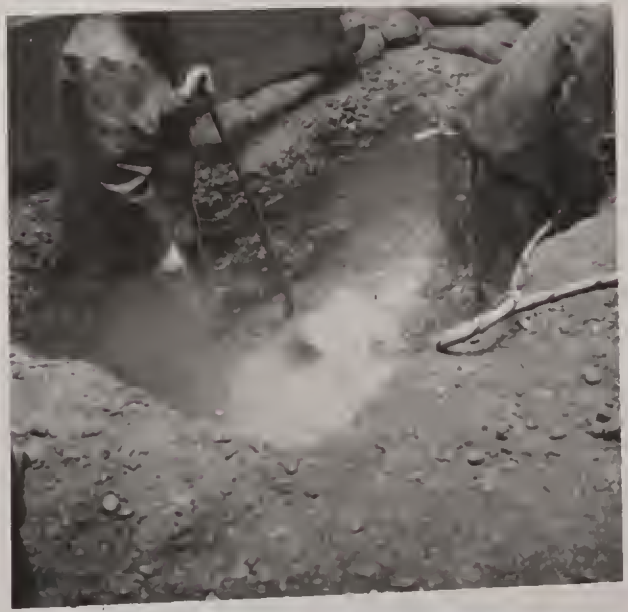
Ditches were dug around the edges to drain the surface of the seal.


119
JAN 1964

Under the laitance, more laitance and poor quality concrete was found.

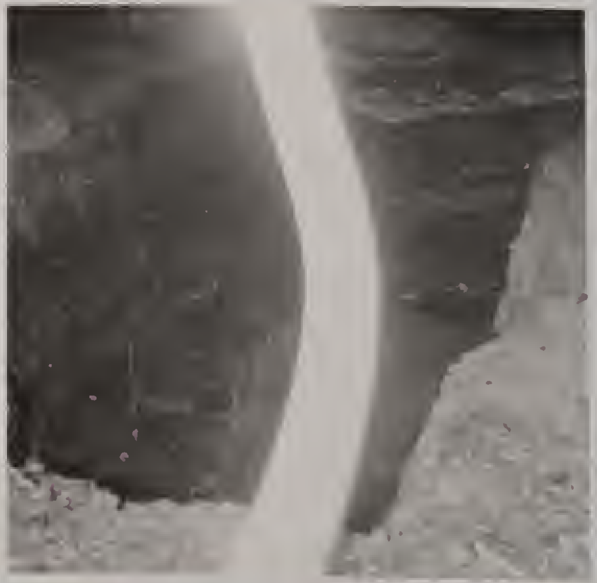
JAN 1964

120

Core drilling was attempted in the seals, but no cores were recovered. A 4 ft. by 8 ft. by 40 inch deep hole was dug in each seal. No solid concrete was found.

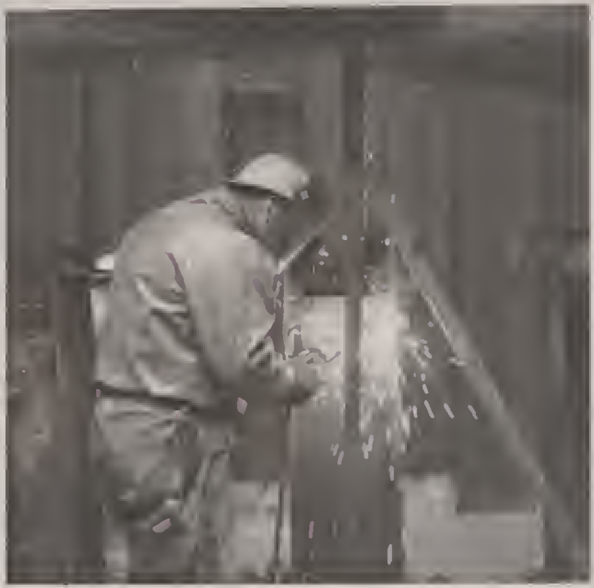

121
JAN 1964

When water started seeping into holes, digging was discontinued.

122
JAN 1964


123
JAN 1964

Cross section of holes dug in the seals. Note the lenses of laitance, sand, and gravel.



124 JAN 1964

124 Welding hold down angles on piles at pier 169.

125 JAN 1964

125 Keith Martin inspecting the welds.

139 SEPT 1963

140 AUG 1963

141

SEPT 1963

142

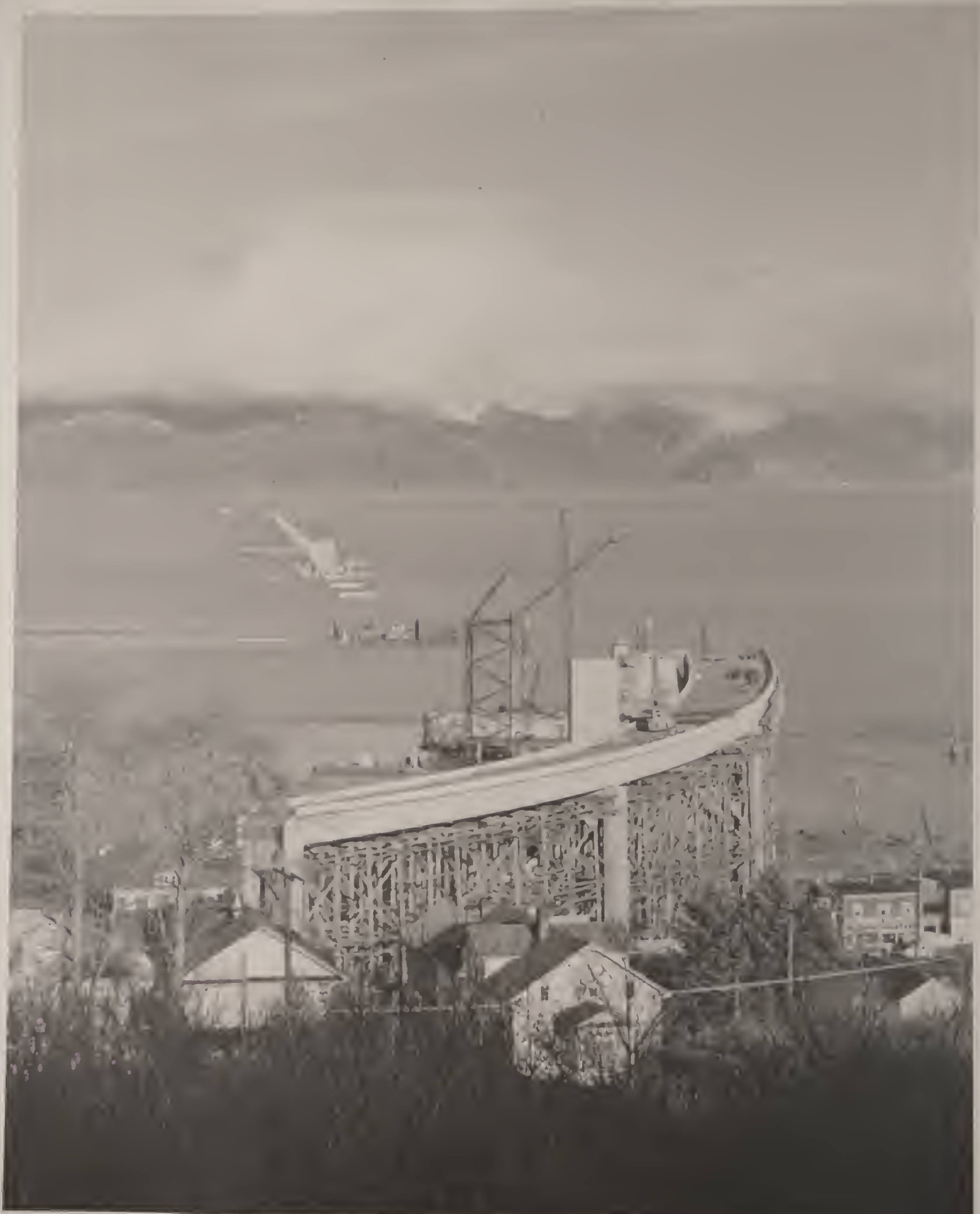
SEPT 1963

143

AUG 1963

AUG 1963

144



JAN 1964

SEPT 1964

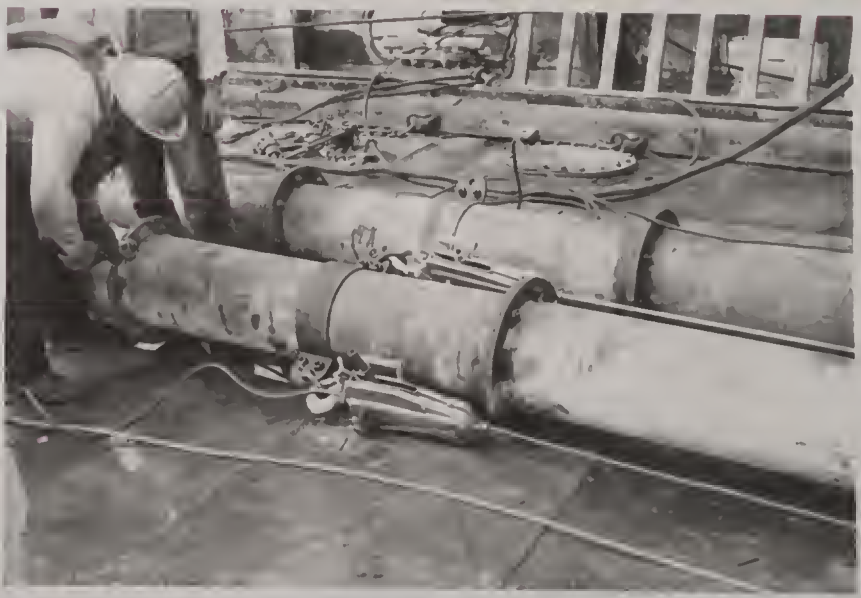
126

127

SEPT 1964

SEPT 1964

129



SEPT 1964

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SEPT 1964

SEPT 1964

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133

JAN 1964

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136

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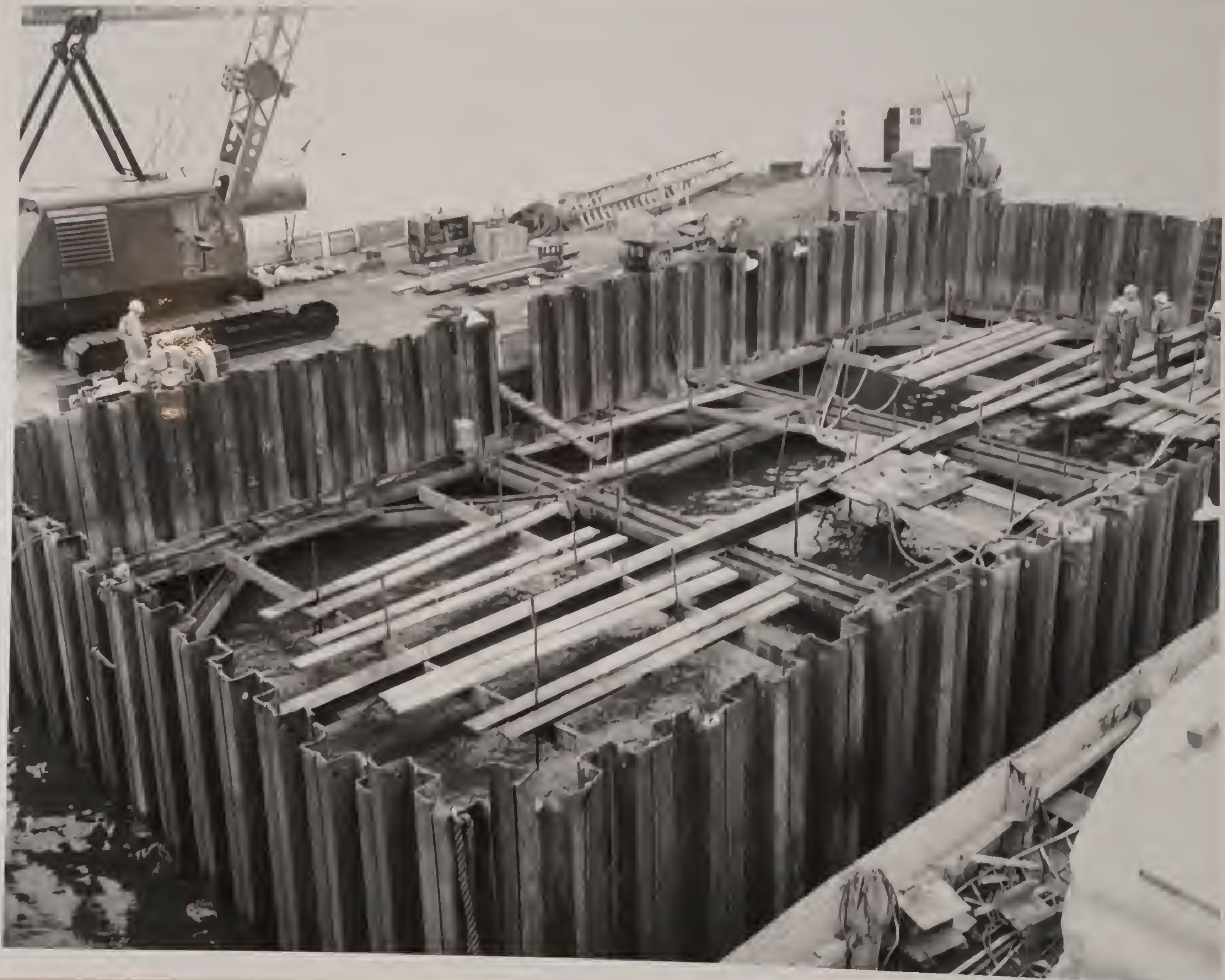
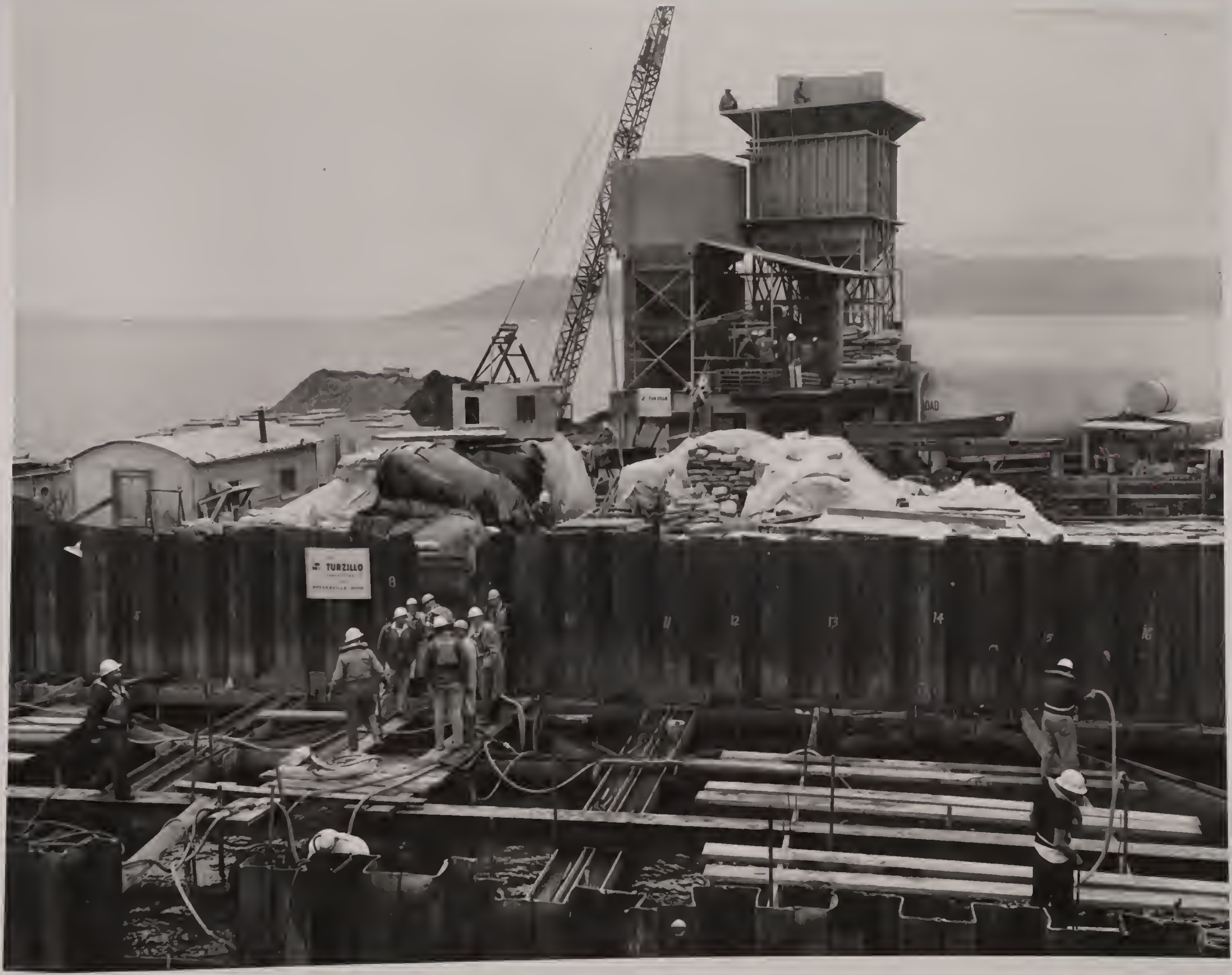
138




TURZILLO
8
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16

SEPT 1964

146

SEPT 1964

147

148

JAN 1965

SEPT 1964

149

SEPT 1964

150

SEPT 1964

151

SEPT 1964

152

DEC 1964

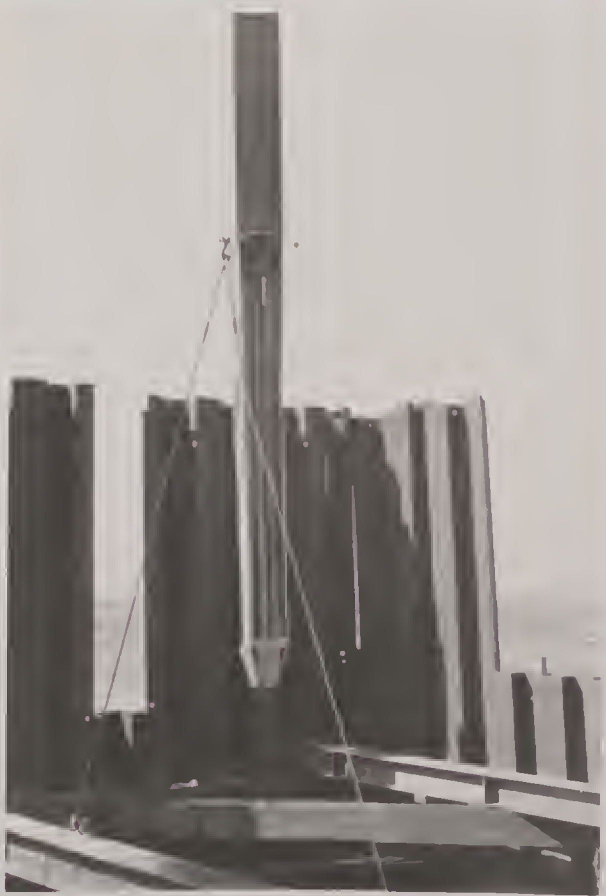
153

AUG 1964

154

AUG 1964

155



156

SEPT 1964

OCT 1964

157

158 NOV 1964

AUG 1964

159

NOV 1964

161

OCT 1964

160

OCT 1964

162

NOV 1964

163

DEC 1964

164

AUG 1965

167

168

169

AUG 1964

170

AUG 1964

172

175

JULY 1965

AUG 1965

AUG 1964

173

512

174

298

MAR • 65

FEB 1965

176

AUG 1965

126 Trimie pour set up used by Raymond International.

127 Batch plant with 1½ c.x. turbine mixer.

129 Tremie pipe with footvalve. Tremie pours were started with a "dry pipe".

130 After the tremie pipe was full of concrete, the come-a-longs holding the footvalve were released.

131 Tremie stand, tremie pipe and hopper setting on top of a pier shell.

132 Air operated cable hoist used to raise and lower the tremie pipe.

133 Excessive laitance near the top of a pier shell being removed.

139 Fascines for use in scour prevention at Pier 169 were made of 20ft. long older trees.

140 The trees were placed in a wooden trough. A row of sand bags was then p;aced in the center, then more trees on top.

141 The fascines, or bundles, were tightened up with a chocker and then bound with wire.

142 Fascines being stacked on a barge.

143 Fascines being dropped in area around cofferdam at pier 169. The theory of the fascine is that once on the river bottom in an eroded area, the sand would fill in around them and over them with the tidal action. Then succeeding layers could be placed.

144 Project Engineer Bob Ellison observing fascine placing operation.

134 State divers making inspection of first left of tremie concrete at Pier 10. Air left was used to remove excessive laitance. Superintendant Frank Wisnovsky is on right.

135 Barge 102 with crane and batch plant during freezing weather. Ice formed when spray hit barge during storms.

137 Barge 102 sank and overturned when spud on stern tore loose during a strong ebb tide. Only the hull of the barge was recovered.

138 Contractors tug "Bruce" during freezing weather.

145A Pier 168 Seal Pour. Preplaced aggregate concrete was used which involved in trusion grouting of 3 inch to $\frac{1}{4}$ inch aggregate which was placed in the cofferdam prior to the grouting operation. Groute pipes and sounding wells extend above the water level.

145B BPR personel enspecting seal pour at pier 168. The batch plant for the i~~xxxxxxxxxxxxxx~~was intrusion grout was the same one used for other concrete pours. Fly ash was ~~x~~ added to the mixer from sacks.

147 Cylinders were made of the intrusion grouted concrete

5

126 Tremie pour set up used by Raymond International.
Tremie stands at left are setting on top of pier shells.
~~Crane Barge Bath plant is on crane barge.~~
Batch plant and aggregate barges are to the right.

3½

127. ~~Batch plant on Bar~~ Batch plant with 1½ c.y. turbine mixer.

5

129. Tremie pipe with footvalve. Tremie pours were started with a "dry pipe".

5

~~129~~. 130 After the tremie pipe was full of concrete, the come-a-longs holding the footvalve were released.

3½

~~130~~. 131 Tremie stand, tremie pipe and hopper setting on top of a pier shell.

5

132. Air operated cable hoist used to raise and lower the tremie pipe.

3½

133. Excessive laitance near the top of a pier shell being removed.

5

134 State divers making inspection of first lift of tremie concrete at Pier 10. Air lift was used to remove excessive laitance. Superintendant Frank Wisnovsky is on right.

5

135. Barge 102 with crane and batch plant during freezing weather. Ice formed when spray hit barge during storms.

5

137. Barge 102 sank and overturned when spud on stern tore loose during a strong ebb tide. Only the hull of the barge was recovered.

5

138 Contractors Tug "Bruce" during freezing weather

8

(145A) Pier 168 Seal Pour. Preplaced aggregate concrete was used which involved intrusion grouting of 3 inch to 1/4 inch aggregate which was placed in the cofferdam prior to the grouting operation. Grout pipes and sounding wells extend above the water level

3 1/2

139. Fascines for use in scour prevention at Pier 169 were made of 20ft long alder trees

5

140 The trees were placed in a wooden trough. A row of sand bags was then placed in the centre, then more trees on top.

141 ~~The bundles, or fasce~~ The fascines, or bundles, were tightened up with a chocker and then bound with wire.

3 1/2

142. Fascines being stacked on a barge

3 1/2

143 Fascines being dropped in area around cofferdam at pier 169. The theory of the fascine is that once on the river bottom in an eroded area, the sand would fill in around them and over them with the tidal action. Then succeeding layers could be placed.

5

144. Project Engineer Bob Ellison observing fascine placing operation.

4

(145B) BPR personnel inspecting seal pour at pier 168. The batch plant for the intrusion grout was the same one used for other concrete pours. Fly ash was added to the mixer from sacks.

8

147 ~~Cylinders~~ Cylinders were made of the intrusion grouted concrete by first filling the mold full of aggregate, and then pumping grout up through the bottom of the cylinder.

146 5 Soundings of the grout level were take in special "sounding wells" with a weight that would sink in water, but float on grout.

3½

148 Superintendants for Lee Turzillo Co. (forward) and John Stoutenburg of Raymond Intl. (rear).

5

150 ~~[illegible]~~ Use of churn drill with these bits were unsuccessful in breaking up the seal concrete

5

151. Pump assembly used by Haliburdon Engrs. for high pressure (2500psi) jetting at pier 169 (seal removal). These jets did not work as fast as the 400psi high volume jets. ~~Haliburton men thought~~

5

152 Pipe leading from 2500 psi pump to jet. 38 such 90 degree bends in line between pump & nozzel.

5

153 "Concrete Buster" used as drop hammer to break down high mounds of concrete.

7

154. Jet pipe used for seal removal at pier 169. The section of H-pile was welded to the jet pipe for additional weight. Jackhammer bits were welded to the nozzel to help break up the concrete when the jet was dropped.

3½

156 "Beam jet" used to break up seal concrete by alternately raising and dropping it. Jet was ~~400 psi, 1200 gpm~~. 400 to 600 psi, 1200 gpm.

5

157. Modification of beam jet tip.

3½

158 Another modification of beam jet tip.

5

159. Two pumps used for jetting seal concrete.

5

160 End of 12 inch air lift used to remove broken up seal concrete from the cofferdam. Jets, welded to the air lift, were sometimes used in conjunction with it.

5

161. End of air lift after several shifts of use.

5

162. When objects got stuck in the air lift it was often a time consuming process to remove them.

5

163. Small charges of explosives were used extensively to break up hard pockets of seal concrete. Shaped charges made with funnels were only moderately successful.

5

164. Divers were able to hook onto large concrete boulders. Most of these were very poor quality concrete.

(167-172) Early stages of steel erection by American Bridge Division of U.S. Steel.

5

173. Structural steel being cantelevered out from pier 170.

5

174 Pier 169 nearly complete (left). Pier 168 cofferdam being removed (right). American Bridges' tower crane in center. Tip of boom reached 405 feet above water.

175 Structural steel cantelevered out from pier 170.

5
176 A contract was let to Umpqua Navagation to place riprap around all piers

20.002.001